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ABSTRACT

The research described in this report attempts to estimate the costs of providing an appropriate education to all school-aged handicapped children by 1980-81. The study begins by addressing the aspects of special education that will help to predict future costs--patterns of growth to the present, legal and political mandates, the nature of various handicapping conditions, and the range of programs and services for handicapped children. Two different economic approaches to cost estimation are analyzed. The report then summarizes the available information concerning the costs of special education and presents a particular approach to special education cost estimation, known as the resource-cost model approach. Data to operate the resource-cost model for national cost projections are established, and the results of the model's projections of the national costs of special education are presented. Sensitivity analyses for each of the model's variables are conducted. Following the conclusions of the study are a discussion of the policy implications of the results and suggestions for further research in the area. (Author/MLF)

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Final Report

Project No. 443AH80042
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ESTIMATING THE COSTS OF EDUCATING HANDICAPPED CHILDREN:

A RESOURCE-COST MODEL APPROACH

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January 1979

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CHAPTER I

INTRODUCTION

On November 29, 1975, the "Education for All Handicapped Children Act" was signed into law by President Ford. This event climaxed years of effort by parents, professional associations, and educators to establish the educational rights of handicapped children as a national policy. The law, known as P. L. 94-142, provides that all handicapped children are to receive a free, appropriate public education; that this is to be accomplished by 1980 for children ages three to twenty-one; that handicapped children are to be served in the least restrictive educational setting possible; that appropriate identification and assessment procedures are to be established; that for every handicapped child an individual education program is to be developed, specifying both the child's educational needs and the special education services to be provided; and that the states and school districts are to be responsible for carrying out these provisions. This law complements and extends the mandatory legislation existing in forty-eight states which specifies educational rights for all handicapped children.

As a result, special education, as education for the handicapped is known, has been confronted with an enormous challenge and opportunity. Although educational programs for the handicapped began in this country in the early

1800s, estimates by experts indicate that from one-quarter to one-half of the handicapped children in the United States either receive no educational services or are in an inappropriate educational program. Even using the lower of these estimates, this would mean that there are in excess of one million handicapped children in need of appropriate educational services. In addition, the requirements of P. L. 94-142 and similar state laws will entail reevaluating present special education students and providing new or additional educational services to many of them.

To assist in meeting the costs of implementing P. L. 94-142, Congress authorized the federal government to increase substantially its financial contribution to special education. The legislative authorization is based on an annually increasing percentage of the national average expenditure for nonhandicapped children. The percentage begins at five percent in fiscal 1978, rises to forty percent in fiscal 1982, and maintains this level thereafter. This translates into an authorization ceiling of $3.16 billion in 1982 with lesser amounts in prior years. If the full authorization amounts are actually funded, P. L. 94-142 would represent the largest single federal expenditure for education, surpassing even Title I, ESEA.

However, in the federal legislative authorization no attempt was made to match the possible funding levels with a thorough estimate of the total costs of special education;

the authorization levels were established primarily to limit the federal expenditures on a program of unknown future magnitude. The limit of federal expenditures for special education, coupled with the unlimited commitment and requirement to provide an appropriate education for all handicapped students, raise significant questions about future funding sources. Will the federal authorization levels be sufficient to meet the increased costs? Will the actual federal appropriations correspond to the authorization levels? What additional funding, if any, will be required from states and school districts? To answer these questions, it is first necessary to have a reliable estimate of what the costs of special education under the new laws will be.

What will it cost to meet the mandates of P. L. 94-142 and similar state legislation? The new national and state laws will require changes in program practices which in turn will cause changes in special education costs. How to estimate the expected costs of special education is the central focus of this study.

Estimation of costs in special education is a complex undertaking. The determinants of costs are imbedded in the programmatic aspects of the educational process. In essence, the question of what are the costs of special education is the last one that can be answered. To arrive at that point, a whole series of programmatic questions must be resolved first. These include: Which children are handicapped to the extent that they require special education? How many such children are there? What educational programs and services are needed for handicapped children? How do the appropriate programs and services differ by type of handicap and for children with differing degrees of severity of the same handicap? What do the programs and services consist of? What resources (e.g., personnel, instructional materials and supplies, equipment, facilities) are required in each type of program and service? What are the quantities and prices of the necessary resources? How many children can be served by one unit of each program or service?

Future cost estimates of special education must take into account the current and expected changes in programs and practices caused by recent legislative and judicial actions, implementation efforts of school districts, and advances in curriculum and educational technology. An extrapolation of the past is an inadequate means of predicting the future for special education. Through new laws and regulations, the federal and state levels have undertaken a deliberate effort to cause programmatic changes at the local level. For instance, the emphasis on the least restrictive environment may well mean that more handicapped students will be served in "mainstream" or school-based programs and fewer in separate or institutional placements. If so, significant cost changes could occur as a result of: regular classroom teachers (after special training) being able to teach some handicapped students in their classrooms; different types of special education teachers being required; more handicapped students being served by one mainstream type special education teacher than by two or three separate class special education teachers; and a decline in high cost institutional enrollments.

Once these programmatic issues are resolved, then the calculation of costs can proceed in a relatively straightforward manner. However, there are serious and significant problems which are raised in attempting to answer the fundamental programmatic questions in special education. These difficulties are caused by: the lack of clear, educationally relevant definitions of handicapping conditions; no reliable information about the rate of occurrence of handicapping conditions; a lack of knowledge of the educational effects of various types of special education programs; professional disagreements over how various handicapped children can be best treated educationally; the shortage of specific data concerning the effectiveness of alternative patterns of resource use in special education programs; wide variation in actual practice in the programs and services provided to similarly handicapped children in different states and school districts; a general lack of standardization of definitions, policies, programs, practices, and procedures across states and school districts; and underlying it all, a lack of clarity over the various objectives of different special education programs (e.g., academic achievement, social behavior, vocational competence, self-help skills).

To summarize then, the problem is one of estimating the costs of a complex educational process in which: 1) the population is not known with certainty; 2) there is a lack of agreement on proper treatments; 3) there are great variances in the composition (resources utilized) of treatments; 4) there is a lack of agreement on the matching of populations and treatments; 5) the practices and technology are in a state of change, in large part due to public mandates which come from outside the educational system; 6) there is significant uncertainty about future events and possible changes which could greatly affect costs; and 7) the objectives or outputs of the various treatments are widely different and in many cases non-comparable.

This dissertation represents a major attempt to estimate the costs of providing an appropriate education to all school aged handicapped children by 1980-81. Although it is an initial effort and subject to refinements, the methodology utilized, because of its focus on the programmatic variables and their relationships, deals with the issues and problems inherent in cost estimation of special education programs and allows for relatively easy inclusion of new information to update the cost estimates.

The methodology also provides a policy orientation to the cost estimation approach since those in decision making positions in special education face a host of policy issues and questions which arise out of the interrelationships between programmatic decisions and the consequent costs of special education. For example: How can the cost changes due to the new students expected to be served in special education be estimated--both increased numbers and different types of handicapped students? How can the cost changes due to expanding the existing special education programs and also due to adding new programs and services for handicapped students be estimated? How can the costs of serving students in the least restrictive environment be estimated? How can the cost changes of utilizing new, different, or varying resources to serve handicapped students be estimated (e.g., greater use of instructional aides, specialized materials and equipment)? How can the costs of newly required procedures, such as identification, individual educational programs, and supportive services, be estimated?

While the future costs of special education depend upon programmatic decisions to be made about serving handicapped children, the reverse is also true. The numbers of handicapped children to be served and the types of programs and services to be provided to them also depend upon the funding which is available for special education. Because of competing demands and limited resources, within the broad framework of the new legislation, what can or will be done in special education or how it will be done is contingent upon what the costs will be. There are numerous policy decisions to be made at the local, state, and federal levels which affect costs. The cost estimation approach used in this study also serves as a flexible tool for policy analysis. It provides the ability to project the cost impact of possible programmatic changes prior to their implementation, to compare the costs of alternative means of accomplishing similar objectives, and to make tradeoffs among various alternatives to meet budget constraints.

This study begins in Chapter II by addressing the aspects of special education which will help to predict future costs--patterns of growth to the present, legal and political mandates, the nature of the various handicapping conditions, and the range of programs and services for handicapped children. The discussion of these major issues describes the linkages between the programmatic components and the resultant costs of special education. The chapter also illustrates a basic tenent of this study: that the total costs of special education are a function of the choice of programs and services provided to handicapped children.

Two different economic approaches to cost estimation are analyzed in Chapter III. They are the use of a representative firm as a prototype for estimating industry-wide costs and the creation of a production function to describe in mathematical form the relationship between the inputs and the outputs of a process. The underlying theory of each is explored, along with their strengths and weaknesses as applied to special education. Although both approaches were initially developed for the private sector and neither is entirely appropriate to special education, there are features of each approach which can be adapted to estimating the costs of special education.

Chapter IV deals with the available information concerning the costs of special education. The most recent reported expenditures for handicapped children are presented to show the current magnitude of funding and to provide a baseline for measuring necessary increases. A general review of cost concepts applied to education provides a background to an examination of the characteristics of special education costs and the types of costs relevant to special education. The existing literature is surveyed in a review of previous cost studies in special education, particularly those few attempts at national cost projections.

In Chapter V a particular approach to special education cost estimation, known as the resource-cost model approach, is presented. This method, which is a type of educational production function, establishes a resource-cost model of the special education process in which the relationships among the students, programs, resources, and decision rules involved in the special education "production process" are specified. Costs are estimated by specifying and pricing the resources necessary to provide special education programs.

Data to operate the resource-cost model for national cost projections are established in Chapter VI. Input values for each of the resource-cost model's variables are derived from an analysis of data from a group of twenty-six states which had used the model to develop their own state projections. Three values--"most likely," low alternative--are developed for each variable. These values are used in the model to examine the range of possible future costs under varying assumptions and to test the impact on national cost estimates of different values of each variable.

The results of the resource-cost model's projections of the national costs of special education are presented in Chapter VII. The total cost estimates based on the most likely input values are given and the major causes for projected increases over current costs are analyzed. These most likely estimates are then compared with the estimates obtained by using the low and high alternative input values and the reasons for the variations among the different estimates are examined.

Sensitivity analyses for each of the model's variables are conducted in Chapter VIII. To indicate their relative effects on the projected costs of special education, a sensitivity index is calculated for each variable. Additionally, the dollar impact of substituting the low and high alternative input values for the most likely input value for each variable is determined. These measures provide a means of assessing the importance of each variable in the estimation of the total costs of special education.

The conclusions of the study are provided in Chapter IX. After a brief summary of the research problem, the approach taken, and the basic findings, a review of the resource-cost model approach as a cost estimation methodology and its application to special education is undertaken. This is followed by a discussion of the policy implications of the results and suggestions for further research in the area.

CHAPTER II

SPECIAL EDUCATION

In order to provide a background and context for an analysis of the costs of special education, this study begins with a review of special education itself. The aspects of special education which will assist in understanding the current costs and estimating the future costs of special education are examined.

Initially, statistics showing the historical development of special education are presented. These illustrate the very rapid growth of special education in recent years and indicate the large potential for additional growth which is expected. Legal and political mandates which have been primarily responsible for the increases in the number of handicapped children receiving special education and have provided the major impetus underlying the rise of special education as an issue of national concern and importance are reviewed. The evolution of special education in the United States is also traced together with the larger social issues affecting its past and future progress.

The key elements of the educational and programmatic content and structure of special education are presented through a discussion of two major issues: classification of handicapped students; and special education programs and services. These discussions provide a framework for understanding the direct linkages between programmatic concerns and issues and the resultant costs of special education.

What is Special Education?

The term special education refers to educational programs and services which are provided for students with mental, physical, and emotional handicaps. The focus of special education is on identifying and serving the unique educational needs of the handicapped student, rather than fitting the student into a standardized educational program based on the range of average needs and abilities. Generally, special education programs are an addition to or a replacement for a regular educational experience. In addition to academic instruction, this could include instruction in such areas as sign language for a deaf child, braille for a blind student, or toilet training for a mentally retarded student.

A review of a number of definitions of special education[1] yields the following aspects which are commonly included: a different type of educational program for handicapped students who cannot benefit from a regular educational program alone; specially designed programs, curricula, and teaching methods aimed at meeting the individual educational needs of handicapped students; a greater variety of programs and services than found in regular education, including identification and assessment procedures, direct instruction of handicapped students, assistance to regular and special education teachers of handicapped students, specialized instructional materials and equipment, supportive services designed to assist the educational process for handicapped students, and assistance to parents of handicapped students; and instruction in a range of educational settings, including regular classrooms, special classrooms, special schools, hospitals, institutions, and in the home.

Growth in Special Education 1922-1976

Over the past half century there has been dramatic growth in the number of handicapped children who have received special education services. The growth of special education since 1922 (the year that the U.S. Office of Education began collecting special education statistics) is shown in Table 2.1. As can be seen, in 1922, after more than one hundred years of effort, special education was extremely limited in the United States--consisting primarily of programs for the mentally retarded and encompassing only 0.1% of the total school age enrollment. Current estimates of the proportion of students needing special education tend to be in the 10% to 12% range. By 1948, many more handicapping conditions were receiving significant attention and the speech

TABLE 2.1

NUMBER OF STUDENTS ENROLLED IN SPECIAL EDUCATION PROGRAMS PROVIDED BY PUBLIC SCHOOLS (STUDENTS IN THOUSANDS)

Type of Handicap	1922	1932	1940	1948	1958	1968	1971	1976
Mentally Retarded	23	75	98	87	223	704	872	990
Emotionally Disturbed	no data	14	10	15	29	99	156	302
Speech Impaired	no data	23	126	182	494	1,122	1,360	1,341
Hearing Disabilities	3	4	13	14	21	65	80	94
Visual Disabilities	no data	5	9	8	12	23	31	41
Crippled & Other Health Impaired	no data	40	53	47	57	109	183	229
Specific Learning Disabilities	--	--	--	--	--	120	167	840
Multiply Handicapped	--	--	--	--	--	9	9	--
Other	--	--	--	3	1	--	--	--
Total Handicapped	26	162	310	357	837	2,252	2,858	3,837
Total K-12 School Enrollment	25,000	28,400	28,250	28,600	39,500	50,500	52,000	49,800
% Handicapped Enrolled	0.1%	0.6%	1.1%	1.2%	2.1%	4.5%	5.5%	7.7%

Sources: 1922-1971 data are from Lloyd M. Dunn, ed., Exceptional Children in Schools: Special Education in Transition (New York: Holt, Rinehart and Winston, 1973), pp. 18-19. 1976 data are from statistics reported by the Bureau of Education for the Handicapped for the purpose of P.L. 94-142.

impaired had become the most prevalent group receiving special education. However, only 1.2% of the school age enrollment was being served by special education. In the following twenty years (1948-1968), there was a six fold increase in the number of special education students, but due to an overall increase in the total school age enrollment, still less than 5% were in special education. The last eight years (1968-1976) have seen an intensification of the growth of special education with almost four million pupils and 7.7% of the total school age enrollment being served. From an early, but extremely limited beginning, special education has evolved into a significant and integral component of the education system in the United States.

However, it is only in recent years that special education has really begun to make its presence felt. Table 2.2 illustrates this point through a comparison of the growth in special education between a twenty-year period following World War II and the most recent eight-year period for which comprehensive data are available. Several observations are of interest:

1. The increase in numbers of students served over each of the time periods is approximately equal. In the twenty-year period 1.9 million students were added to special education in a time of rapid overall school expansion. However, 1.6 million students were added to special education

TABLE 2.2

SPECIAL EDUCATION PROGRAM GROWTH IN PUBLIC SCHOOLS
(STUDENTS IN THOUSANDS)

Type of Handicap	Program Growth			
	1948 - 1968		1968 - 1976	
	Students	Annualized %	Students	Annualized %
Mentally Retarded	617	11%	286	4%
Emotionally Disturbed	84	10%	203	15%
Speech Impaired	940	9%	219	2.5%
Hearing Disabilities	51	8%	29	5%
Visual Disabilities	15	5%	18	8%
Crippled & Other Health Impaired	62	5%	120	10%
Specific Learning Disabilities	120	NA	720	29%
Total Handicapped	1,895	10%	1,585	7%
Total K-12 School Age Enrollment	21,900	3%	(700)	(0.2)

during the last eight years, a period of slight decline in school enrollment. This represented a 70 percent increase in the size of special education in eight years.

2. The annualized growth percentages for the total number of handicapped students were well above the rates for the total school age enrollments.

3. There was considerable variation among the different types of handicapping conditions in the absolute numbers of students added and the growth rates. In the 1968-76 period the specific learning disabilities (SLD) category was by far the largest gainer with an increase of 720,000 students and an annualized growth rate of 29%. These very large increases were due to the rapid development of assessment techniques and teaching practices for the new SLD category during this period and its low starting base. Other categories with large increases were mentally retarded (primarily mildly retarded), speech impaired, and emotionally disturbed. The emotionally disturbed category has a relatively high growth rate as it has also recently increased due to a new emphasis on diagnosis and treatment; the mentally retarded and speech impaired categories, being well established prior to the period, show low growth rates. These handicapping conditions are, for the most part, less severe

and can be served in school environments less restrictive than other, more severe, handicapping conditions. It should be noted that many of these mildly handicapped children were attending school all along, but they were seen as lazy, uncooperative, trouble-makers; they were often suspended, failed year after year, or socially promoted.[2] Prior to new diagnostic and teaching methods, such students were not viewed as handicapped; consequently, they received no special education services.

In comparison with the rapid and large increases of handicapped students in the local public school programs described above, the residential schools for handicapped students have shown only slight growth in a similar period (See Table 2.3). Generally only the more severely handicapped students remain in the residential schools. These conditions tend to have a low occurrence rate, are readily identifiable either through physical or behavioral traits, and have had established programs for many years. For the most part, students requiring these types of programs have already been identified; thus there has been little room for large program growth.

In spite of the very large gains in the number of handicapped children receiving special education in recent

TABLE 2.3

ENROLLMENTS IN PUBLIC AND PRIVATE RESIDENTIAL SCHOOLS (STUDENTS IN THOUSANDS)

Type of Handicap	Enrollments		Annualized Growth %
	1963	1970-71	
Mentally Retarded	39	46	2.5%
Emotionally & Socially Maladjusted	49	58	2.5%
Hearing Impaired	17	20	2.5%
Visually Handicapped	7	9	2.5%
Total Handicapped	112	133	2.5%

Source: U.S. Bureau of the Census, Statistical Abstract of the United States: 1976, 97th ed. (Washington, D.C.: Government Printing Office, 1976), Table No. 196.

years, it is estimated that only one-half to two-thirds of the total number of handicapped students are receiving an education appropriate to their needs.[3] This is reflected in Table 2.4 which shows the served and estimated number of unserved handicapped children in 1976-77. The estimated total and unserved numbers of handicapped children are based on a total incidence rate for handicapping conditions of approximately 12%. Estimates of the incidence of handicapping conditions for special education are for the most part broad estimates and not well documented. Although these estimates are subject to serious limitations, they do provide an indication of the potential magnitude of special education.[4]

Within the various types of handicaps, there are wide variations in the estimated percentage of children being served. Some of the older, more established programs (e.g., mentally retarded, speech impaired) and those serving students with more obvious handicapping conditions (e.g., visual disabilities, crippled) have high estimates of the proportion of children served. The newer programs (e.g., specific learning disabilities, emotionally disturbed) show a much lower service level. The low percentage served for hearing disabilities is caused by combining the deaf (94% served) with the hard of hearing (24% served and a much larger number of children).

Thus, while much has already been accomplished in special education, particularly since 1968, much remains

TABLE 2.4

SERVED AND UNSERVED HANDICAPPED CHILDREN OF SCHOOL AGE 1976-77 (CHILDREN IN THOUSANDS)

Type of Handicap	Total Estimated Handicapped Children		Children Served		Estimated Unserved Handicapped Children
	% of Total Population[a]	Number[b]	Number[c]	%	
Mentally Retarded	2.3%	1,146	990	86%	156
Emotionally Disturbed	2.0%	997	302	30%	695
Speech Impaired	3.5%	1,744	1,341	77%	403
Hearing Disabilities	0.575%	286	94	33%	192
Visual Disabilities	0.1%	50	41	82%	9
Crippled & Other Health Impaired	0.5%	249	229	92%	20
Specific Learning Disabilities	3.0%	1,495	840	56%	655
Total	12.035%	5,997	3,837	64%	2,130

a. Bureau of Education for the Handicapped, "Estimated Number of Handicapped Children Served and Unserved, by Type of Handicap," March 1976. (Mimeographed.)

b. Based on a total school age enrollment of 49,826,000 students which comes from DHEW, Projections of Educational Statistics to 1985-86 (Washington, D.C.: Government Printing Office, 1977), p. 14.

c. Reported by the Bureau of Education for the Handicapped for the purposes of P.L. 94-142.

to be done if all of the estimated unserved handicapped children are to receive an appropriate education.

Judicial and Legislative Activity in Special Education

In recent years the major impetus behind the growth of special education has been the many judicial and legislative actions in establishing and affirming the educational rights of handicapped children. Since approximately 1970, a multitude of court decisions and new state and national laws have greatly increased the magnitude and scope of present special education programs. Perhaps more importantly, these activities have significantly expanded the expected level of future special education programs. As the results of these actions have largely been incorporated into the legal system governing special education (e.g., statutes, educational code provisions, regulations, and consent decrees) their impact will influence and direct special education for years to come.

Beginning in 1971, numerous court decisions have repeatedly found in favor of handicapped children and their parents, and have ruled that states and school districts must provide proper special educational programs for handicapped students.[5] The recent lawsuits have focused on two major issues of constitutional significance: 1) the right of handicapped children to a free public education; and 2) equal education opportunity for handicapped children. The first issue struck at the then prevalent exclusion statutes and regulations of states and school districts which prohibited handicapped children from receiving a public education. Lawsuits in this area have concentrated on removing legal and procedural barriers for the education of handicapped children and on establishing unequivocally their rights to a free public education. The second issue, equal educational opportunity, has taken the form of ensuring an appropriate education for every handicapped child. Lawsuits concerning this issue have sought changes to prevent the arbitrary assignment of handicapped children to educational programs not appropriate to their needs.

Most of the court decisions prior to the mid-twentieth century concerning the educational rights of handicapped children favored the school officials over the handicapped children. They were based on the premise that school attendance for any child was not a right, but a privilege to be granted or withdrawn at the discretion of the school authority.[6] The court decisions upheld the exclusion laws then present in most states. For example, in 1919 the Wisconsin Supreme Court upheld a local district's authority to exclude a cerebral palsied child from school on the school board's claim that "his condition and ailment produce a depressing and nauseating effect upon the teachers and school children; that by reason of his physical condition he takes up undue portion of the teacher's time and attention, distracts the attention of the other pupils, and interferes generally with discipline and progress of the school."[7] The state statute which was relevant in this decision was one which stated that a child's right to attend school could not be enforced if its presence was harmful to the best interests of the school. In other examples, Alaska excluded "children with bodily or mental conditions rendering physical attendance inadvisable," and Nevada allowed exclusion when "the child's physical or mental condition or attitude is such as to prevent or render inadvisable his attendance at school or his application to study."[8] The determination of when attendance was "inadvisable" was made by the school officials with little or no recourse for the handicapped children or their parents. The ultimate authority of the school officials prevailed also in compelling certain handicapped children to attend distant residential schools against their parents' wishes when suitable educational programs were not provided locally.[9]

The landmark case for establishing the educational rights of handicapped children was initiated in 1971 by the Pennsylvania Association for Retarded Children (P.A.R.C.) against the Commonwealth of Pennsylvania for failing to provide access to a free public education for all mentally retarded children in the state.[10] The suit claimed that: 1) by excluding severely retarded children from school as ineducable (the common practice in the state), these children were denied equal protection of the laws; and 2) by assigning children to programs for the retarded without prior notice and the opportunity to challenge such placement through a hearing, that the children were being denied due process of the law. Prior to coming to trial, the state conceded the case and agreed to a consent decree which provided that: 1) no mentally retarded children would be excluded from a free public education; 2) all mentally retarded children would be provided with an appropriate education. This was to be accomplished through increased funding and the establishment of due process hearings. And 3) an immediate and thorough search to locate all out-of-school mentally retarded children would be conducted.[11]

A second landmark case, Mills v. Board of Education,[12] was initiated in 1972 in Washington, D.C. The suit was similar to P.A.R.C. in claiming the constitutional right of children excluded from school as ineducable to a free public education and to a due process procedure before placement in special programs. However, an important broadening of this suit was the inclusion of all types of handicapped children in the complaint--physical, mental, and emotional disabilities. The outcome of the suit was a major victory for the educational rights of handicapped children. The court ordered: 1) that all handicapped children be provided a free public education; and 2) that the educational program must be appropriate to the individual child's needs. Furthermore, the court decree included a specific and detailed set of hearing procedures which were to be followed by the District to ensure the due process rights of handicapped children.

Of particular interest to the issue of the cost of meeting the potential unmet needs in special education was the court's response to the District's claim that they were without sufficient funds or would have to divert funds intended for other educational services to serve all handicapped children in an appropriate manner. The court strongly rejected that claim stating that

> . . . the District of Columbia's interest in educating the excluded children must outweigh its interest in preserving its financial resources. If sufficient funds are not available to finance all of the services and programs that are needed and desirable in the system, then the available funds must be expended equitably in such a manner that no child is entirely excluded from a publicly-supported education consistent with his needs and ability to benefit therefrom. The inadequacies of the District of Columbia Public School System . . . . cannot be permitted to bear more heavily on the "exceptional" or handicapped child than on the normal child.[13]

Two lawsuits in California have been in the forefront in establishing the rights of children to an appropriate education. These suits challenged placement practices based on culturally-biased English language I.Q. tests. The use of such tests, it was claimed, resulted in over-representation of Mexican-American and black students in classes for the educable mentally retarded (EMR). In

Diana v. Board of Education,[14] initiated in 1970, the state agreed: 1) in the future to test all children whose primary home language is other than English in both the primary language and English; 2) to retest all children already in classes for the mentally retarded in their primary home language; 3) to develop a new I.Q. test instrument to be used with Mexican-American children to compare their performance with their peers, not with the population as a whole; and 4) to reduce the overrepresentation of Mexican-American children in classes for the retarded.

In a similar suit, Larry P. v. Riles,[15] the court enjoined San Francisco Unified School District from placing black students in EMR classes based on procedures relying on currently available I.Q. tests. Black students then enrolled in EMR classes were to be reevaluated annually using procedures which were not culturally biased and did not result in discrimination.

Since these precedent setting cases, there have been a large number of lawsuits in most all other states seeking the right to education and an appropriate education for handicapped children. With few exceptions these suits have been successful.[16] However, there are limits to what the courts have done and what they can do. Historically, the courts have felt an inability to determine educational need and refused to establish standards of what constitute an appropriate education;[17] rather, they have seen their role as "defining minimal constitutional guarantees."[18] The operational determination of how to carry out the court decisions and what constitutes an appropriate education for an individual handicapped child have been seen as the proper functions of the legislatures and the educators. The courts, however, do retain an overseer role to monitor the progress and content of the implementation activities and to review alleged violations of new laws and regulations. The use of due process procedures, in which the judgment of education officials can be challenged by parents, has been looked on by the courts as a valid safeguard for the rights of the handicapped child involved.[19]

There is a strong relationship between the judicial activity on behalf of handicapped children and the legislative interest and actions. As concluded in a recent study of judicial involvement in equal educational opportunity efforts, "the generally successful litigation on behalf of the handicapped seems less impressive for what it directly achieved than for the state and federal legislation which it provoked."[20] Court decisions provide legitimatization of the political demands on the legislature of interest groups representing the handicapped. Since 1971, thirty-five states have passed new legislation mandating the provision of proper educational programs for handicapped children, bringing the total number of states with such statutes to forty-eight.[21] Furthermore, many legislative actions were specifically designed to respond to court decisions or to head off new lawsuits.[22] For example, in response to the Diana and Larry P. decisions, the

California legislature modified the California Education Code to specify racial and ethnic balance in EMR classes as state policy; specific admissions criteria were established; special admissions and discharge committees were required at the district level; and parental approval was made necessary for placement of children in EMR classes.[23]

At the federal level, the Education of All Handicapped Children Act (P.L. 94-142) has established a national mandate requiring that " . . . all handicapped children have available to them . . . a free appropriate public education which emphasizes special education and services designed to meet their unique needs . . ."[24] regardless of the extent or severity of their condition. The deadline for achieving this goal was set as 1978 for children ages three to eighteen, and as 1980 for those ages eighteen to twenty-one. In addition, the law provides guidelines for its implementation which have important programmatic and cost implications. The major provisions include:

1. Eligibility for special education extended to preschool and postschool aged handicapped children.
2. Active and thorough efforts to locate all handicapped students.
3. Nondiscriminatory testing and evaluation of students.

4. An individual written instructional program required for every handicapped student.

5. Placement of handicapped students in the the least restrictive educational environment consistent with diagnosed needs.

6. Due process procedures for handicapped students and their parents.

7. Confidentiality of records.

8. Priority of service to handicapped children not in school and those who are severely handicapped.

9. Submission of district and state plans with data on students, personnel, and costs--both current levels and estimated requirements for full service to all handicapped students.

These federal provisions are generally consistent with the recent state legislation for education of handicapped children. Together, the new laws will require the states and school districts to expand their educational programs and services for handicapped children very significantly and rapidly to meet the mandates and deadlines for compliance.

Now that the educational rights of handicapped children have been firmly established, the focus is shifting to the implementation of the new federal and state laws.[25] Already there are detailed regulations governing the implementation of P.L. 94-142 by states and school districts, along with a multitude of new guidelines, diagnostic and instructional materials, books, articles, conferences, workshops, pre-packaged management and information systems to provide assistance. Implementation of the new laws promises to be different than an extrapolation of past practices. A changing mix of students with different needs are to be served by special education and there are to be corresponding changes in the type, composition, and relative mix of the programs and services to be provided. If the estimates of the total number of handicapped children are even approximately correct, it may require doubling the present size of the special education program in a very few years to serve them all.

The vast amount of state and federal judicial and legislative activity which is compelling these changes has been undertaken primarily on legal and moral grounds--the constitutional and personal rights of handicapped children to an appropriate education. The fiscal impact of these actions has been a secondary concern. The amount of funding necessary to fulfill the court decisions and legislative promises is unknown. As a result, there have been major financial commitments made on future federal, state, and local resources, but it is not known what the extent of these commitments are.

Development of Special Education in the United States

Special education has developed as society has recognized the need to provide different types of educational services to children who were unable to benefit from a traditional educational program. The form which special education took has been reflective of the common educational and social beliefs concerning the abilities and potential of the handicapped at the time. The development of special education in the United States can be divided into three main phases, each corresponding to a prevalent pedagological philosophy of the time. The phases can be categorized as: 1) the residential school movement, in which certain of the more severely handicapped children were placed in a full-time institution for both education and custodial care; 2) the day school movement, in which separate classes for certain handicapped students were established in public schools; and 3) special services without segregation, in which certain students, generally those with milder handicapping conditions, received at least a portion of their education with nonhandicapped students.[26] Similarly, the three development stages in special education described by Heiny are defined in terms of the prevailing social philosophy toward handicapped children of the period: " . . . 1) treatment through the segregation and restriction of resources for survival for people called different; 2) caring for people regarded as different by providing resources required for their physical existence; and 3) instructing such people so that they may be incorporated into existing, dominant social systems."[27]

It is important to note, however, that the three stages were and are not mutually exclusive. The initiation of a new teaching strategy for handicapped children did not supplant the prior one(s); rather the new strategies were additive. Each succeeding approach has been incorporated into the structure, practice, and financial support of the educational system. Today the concensus among special educators is that, " . . . we find ourselves pressing rapidly into stage three, namely providing programs such that the exceptional individual will be incorporated into the dominant system."[28] Even so, all three educational approaches--residential school, day school, special services without segregation--currently coexist in every state school system, with each approach generally serving the educational needs of children with different handicapping conditions and with varying severity.

Severity refers to the extent of educational need, not to the handicapping condition, per se. Often it is the severity, not the handicapping condition, that determines the appropriate special education program for a child. For example, a child deaf from birth who has no language may be considered to have a severe handicap, while a child whose deafness occurred after the acquisition of language and who has learned concommitant social skills may have only a mild handicap.

Residential School

The first permanent residential school for handicapped children in the United States, the Connecticut Asylum for the Education and Instruction of Deaf and Dumb Persons, was begun in 1817 in Hartford, Connecticut. It opened with seven deaf-mute pupils and Reverend Thomas Gallaudet as its principal. Gallaudet had received his training in education through observation of similar programs in Europe. The school was supported by private charity and a grant from the Connecticut Legislature of $5,000.[29]

In 1829, the New England Asylum for the Blind (later to become the Perkins Institution for the Blind) was incorporated in Boston, Massachusetts with Dr. Samuel Gridley Howe as its director.[30] Three years later, the New York Institute for the Education of the Blind was opened in New York City.[31]

Dr. Howe was also instrumental in the creation of the first school for retarded children as well. Based largely on the report of a state commission, which Howe chaired, the Massachusetts Legislature in 1848 provided a grant of $2,500 for the training of ten "idiotic and feebleminded children."[32]

Using these first schools as models, many states established public residential schools for the deaf, the blind and the moderately retarded, and this approach be-came the norm for serving and educating children with these handicapping conditions. The succession of states establishing residential schools for the retarded provides an example of this growth: 1851 - New York; 1854 - Pennsylvania; 1857 - Ohio; 1858 - Connecticut; 1860 - Kentucky; 1865 - Illinois; 1871 - Iowa; 1879 - Indiana and Minnesota; 1881 - Kansas; 1885 - California; 1886 - Nebraska; 1888 - Maryland and New Jersey.[33] By 1900, over 30 states had publicly supported residential schools and rapid expansion of these institutions continued through about 1920.[34] By 1947, this figure had climbed to 46 states, and also by this time residential schools for socially and emotionally disturbed children had also become widespread with 49 states having such schools.[35]

As this record of establishment indicates, the residential schools were widely accepted as an appropriate means of serving certain handicapped children. Nowhere is this seen more clearly than in the laws and court rulings in many states which required parents to send their children to the residential schools if local educational programs were unavailable.[36] As the residential schools were often located away from large population centers, parents found it difficult to visit their children frequently.

Day Schools

The day school movement in special education arose when parents sought to keep their handicapped children in their home community, but at the same time have them provided with a special education program appropriate to their needs. This movement represented an important shift in the underlying philosophy of special education for most handicapped children--from geographic isolation, state custody, and very limited training to local community responsibility, maintaining the child at home, and education, habilitation and rehabilitation. New teaching methods, techniques, and approaches were soon to follow which reflected these changes.

The first separate day school programs for handicapped children were organized in the latter portion of the nineteenth century in larger cities where there were sufficient concentrations of handicapped children to make up classes. A day school for deaf children was first established in Boston in 1871; a special class for the retarded was begun in 1896 in Providence, Rhode Island; crippled children were first served in a special class in 1899; and in Cleveland in 1909 partially sighted children were first served in a day school class. From these beginnings many other programs were established for these and other types of handicapped children. By 1911, there were day school programs in 220 cities in the United States.[37]

The growth in the day school programs did not come at the expense of the residential schools. Rather, the two approaches were expanding simultaneously. The residential schools typically began earlier and served more severely handicapped children than did day school programs. When day school programs were developed, they extended special education programs to additional students who previously were not receiving them. They did this at a lower public cost also, since the parents, not the state, bore the costs of residence when their children were living at home.

Further Development of Special Education

The day school movement is the first of five factors identified by Cruickshank as major contributors to the development of special education beyond the residential schools. The other factors are: 1) the impact of the two World Wars on societal attitudes toward disabilities; 2) the formation of parent groups and their subsequent activism; 3) research and development in allied fields; and 4) the growth of teacher education programs in special education.[38]

In both World Wars, most males in the United States between certain ages were called for military service and examined prior to induction. There were a large number of these men with no previous indication of a handicapping condition who were rejected as unfit. Therefore, instead of military service, they returned to their normal lives and remained an integral part of the community. Their physical differences were accepted by the community as natural occurrences. Following the wars, many physically and psychologically disabled veterans returned home and took up places in their communities. They had a previous history of normal associations with family and friends upon which to build. The communities' exposure to and acceptance of them opened up the way for a more general change in the stereotyped attitudes of society toward disabilities. This attitude of greater acceptance of individual differences has slowly been extended to physically handicapped children and broadened to include mentally and emotionally handicapped children as well.

Beginning in the 1940s, parents with children of similar handicapping conditions began to organize themselves formally. Their purposes for organization have been: discussion of mutual problems; self-education; promoting public awareness; organizing or advancing projects to meet unmet needs of certain handicapped children; lobbying for passage of appropriate legislation; and establishing public programs for handicapped children.[39] Where previously the stigma of a handicapped child inhibited most parents from acknowledging a child's existence, parents, through local, state, and national organizations, have turned to political and legal activism to secure an appropriate education for their handicapped children.[40]

New developments in a variety of research areas had important impacts on the education of handicapped children. Advances in medicine produced new forms of treatment, and, in some cases, dramatically reduced the number of certain types of handicaps (e.g., the reduction in childhood polio due to the Salk vaccine). Improvements in engineering technology have led to electronic communication equipment for the hearing impaired, sight enhancement and simulation for the visually handicapped, and lightweight prostheses and specialized transportation equipment for the orthopedically handicapped. Research in psychology resulted in greater understanding of individual differences as related to learning theory; it also provided new techniques of identifying, testing, and diagnosing handicapping conditions, as well as new instructional procedures, such as behavior modification, which were incorporated into the special education curricula.

The growth in teacher education programs was directly related to the advances and changes described in the other areas. Where previously many residential schools had maintained an internal teacher training program, the growth of day school programs for the handicapped required many more specially trained teachers to fill the increased demand. Both overall population growth resulting from the baby boom of the late 1940s and 1950s, as well as parent group activism furthered this demand. An important consequence of this demand was a greatly increased job market for teachers of handicapped children. The federal government provided funds to assist higher education institutions in the preparation of professional personnel to work in special education.[41] Research advances provided the experimental evidence upon which the basic concepts and educational applications in the curricula for special education teachers were developed. In conjunction with these events, colleges and universities established the necessary special education training programs to meet the demand for qualified teachers.

Special Services Without Segregation

The third stage of special education is now well under way. The pedagological emphasis for the handicapped has shifted from geographic isolation (residential schools) to educational isolation (separate local schools and classes) and now to educational integration. The basic concept is that of "least restrictive environment," defined by the U.S. Office of Education in its rules and regulations governing the education of handicapped children as:

> 1. That to the maximum extent appropriate, handicapped children . . . are educated with children who are not handicapped, and
>
> 2. That special classes, separate schooling or other removal of handicapped children from the regular educational environment occurs only when the nature or severity of the handicap is such that education in regular class with the use of supplementary aids and services cannot be achieved satisfactorily.[42]

The stress is on an educational placement that is appropriate to the child's needs. The use of residential schools and separate day schools and classes may still be appropriate for some handicapped children, but the first choice, if possible, is for placement in a regular education program with special education support services. As described by Wilson Riles, California State Superintendent of Public Instruction,

> For the marginally handicapped child, the least restrictive environment may be a regular public school class with additional services from a specialist or teacher's aide. However, other children may be served best in a special class with added opportunities, such as field trips and recesses, that encourage handicapped and non-handicapped children to know each other. The most severely handicapped children may continue to be educated apart from the non-handicapped in private and state schools.[43]

The term "mainstreaming" is one that is also currently in wide use in special education. It refers to the practice of meeting the educational needs of many handicapped children primarily through a regular education setting--or in the mainstream of education.[44] It is felt that this practice serves a double purpose: handicapped children will have the benefit of non-handicapped peers as role models; and non-handicapped children will develop understanding and acceptance of the handicapped. Mainstreaming emphasizes the integration of handicapped children into regular classrooms with special education support. Least restrictive environment is a broader term which encompasses all possible placements or program offerings for a handicapped child.

As with the prior stages, the least restrictive environment approach has not and will not eliminate the alternative approaches. Most states have had one or more residential schools for a number of years and still retain them. Separate special classes may remain the most appropriate educational setting for certain handicapped children. The least restrictive environment approach is extending the scope of special education to handicapped children with milder handicaps by allowing them to receive the special education services that they need within the regular program. At the same time, it provides an important program alternative between the poles of service in isolation and no service; this can provide a more normal educational experience for many handicapped children.

Classification of Handicapped Children

There are many classification systems for identifying handicapped students.[45] They basically label certain students as having various handicaps according to physical, sensory, intellectual, or behavioral characteristics. Categorization of students in special education serves three objectives for schools: 1) identification of students who require special services and a means of organizing the provision of those services; 2) specialized funding, earmarked on a categorical basis; and 3) separation of handicapped and non-handicapped students to minimize the interference in the regular school program.[46] For handicapped children labels have become "passports to education," since the use of labels or categories is so widespread that it has become a virtual requirement that every child in a full-time special education program be assigned some label to authorize or justify such placement.[47]

Much of the work in the classification of handicapped children has been done by medical and psychological professionals working separately on different handicapping conditions.[48] Due to the research nature of these efforts, they have taken place most frequently in clinical or isolated educational settings. As a result, there has evolved an emphasis on the separate and independent nature of the individual categories. Separate bodies of knowledge and schools of thought have been developed around each category. Rather than a classification system, the groupings of handicapped conditions could be more accurately described as a collection of separate labels or categories. Even within special education the focus has largely been on the differentiation among different types of handicapped children, instead of on any similarities of educational needs.

The separateness of the classification schemes has extended throughout special education. Colleges and universities train teachers to work with only one type of handicapped child, e.g., deaf. In some states teachers are certified by a specialty and only permitted to instruct one type of handicapped child. Categorical funding patterns restrict funds to specific handicapped children. Parent and professional groups have formed to advance the cause of specific handicapping conditions, e.g., United Cerebral Palsy, Association of Retarded Citizens, Association for Children with Learning Disabilities; these associations have developed into politically active interest groups at the national, state, and local levels.

There exists a continuing controversy over the use of labels for handicapped children in special education. The dispute seems to arise out of a fundamental ambivalence toward labels or categories--wishing to maintain the usefulness and benefits of labels, but at the same time decrying their impact on the children labeled.

The arguments in favor of the use of categorization systems in special education are that they: provide communication devices for exchange of information among educators and between educators and parents; provide (in some cases) a description of a physical condition which has important educational implications; provide a basis for determining the number of students in need of special education services and a method of accounting for children being served in special education; enable local school districts to collect reimbursements from the state for special education services provided; and serve as a rallying point for securing legislative and general public support for special education programs.[49]

Arguments against the use of categorization systems in special education are that they: result in overgeneralizations concerning individual children by treating all children within one category as alike; are self-perpetuating by contributing to "reification" of the child labels used (Reification is a process wherein a label is given to a behavior pattern or a child, and then the label is used to explain the origin of the behavior pattern that has been labeled.); assume that the root of the instructional problems is in the child and remove the "burden of proof" for children's learning from the school by establishing unalterable child conditions (handicap label) as reasons for repeated failure; provide information to the teacher which is largely irrelevant for instruction; place and maintain children into special education programs on the basis of a label (which is frequently permanent) without regard for subsequent changes, growth, development, or improvement; discriminate against minority groups and the poor through the use of culturally biased tests and subsequent "tracking" of children based on these test results; needlessly separate special education from general education, limiting the educational perspective and interaction of both fields; and create stereotyped public images of various types of exceptionalities.[50]

Other criticisms which have been voiced against present classification systems in special education are that: use of discrete labels exclude some handicapped children who do not fit neatly into one of the existing categories;[51] labels can create attitudinal problems among specialists trained in only one area who may feel that they are incapable of working with children with other disabilities;[52] negative expectations caused by the association of disability labels can cause teachers to develop poor relationships with handicapped children and to provide them with an inadequate curriculum;[53] and disability labels place a social and/or psychological stigma on children which may last a lifetime.[54]

However, present classification practices remain predominantly those of the traditional medical and psychological labels; most state classification systems are of this type. Furthermore, the recent federal regulations based on the Education of All Handicapped Children Act (P.L. 94-142), enacted in 1975, utilized traditional categories of handicapped children to establish a classification system. These are:

1. Mentally retarded
2. Hard of hearing
3. Deaf
4. Speech impaired
5. Visually handicapped
6. Seriously emotionally disturbed
7. Orthopedically impaired
8. Other health impaired
9. Deaf-blind

10. Multi-handicapped

11. Specific learning disabilities[55]

In order to receive federal funding for the education of handicapped children, states are required to report statistics to the U.S. Office of Education using these categories. There has been some attempt to make the categories educationally relevant by appending to the traditional medical and psychological definitions a statement that the handicapping condition must adversely affect the child's educational performance.

Each state, however, also maintains its own, unique classification system for special education and there are many variations from the federal categories. For example, California has established a three-tiered classification system with the express purpose of removing the labels from children. In order to receive special education services (and to receive state funding), a child need only be designated as an "individual with exceptional needs." For data collection and reporting purposes, four subclassifications of programs (not pupils) are utilized: communicatively handicapped, physically handicapped, learning handicapped, and severely handicapped. Each of the existing handicapping categories would be grouped under one of the program classifications; for instance, programs for learning handicapped would include pupils formerly labeled as learning disabled, behavior disordered, or educationally retarded.[56]

In other instances, only a portion of the classification system may be different. Hawaii, for example, separates the category of mental retardation into four distinct levels to differentiate the varying levels of adaptive abilities possessed by these students. Thus, their classification includes mild, moderate, severe, and profound retardation as separate subcategories.[57]

The choice of a particular classification system is a decision with significant policy and cost implications. The categories in the classification system define which children will be eligible to receive special education services. They also strongly influence how many children will be included in special education and what types of programs and services will be needed for these children. Additionally, the role of regular education in serving handicapped children must be consistent with those handicapped children, particularly the mildly handicapped, who may be eligible for special education services and be most appropriately served in a mainstream type program. For example, a relatively broad definition of handicapping conditions to be served via special education would increase the number of eligible students by perhaps as much as fifty percent. These increased students would be primarily those with milder handicapping conditions. Appropriate programs and services for these students would frequently be of a different nature than those provided to more severely handicapped students. The differences in programs would cause substantial per pupil cost differences; the cost of special education services for a mildly handicapped student would be less than the cost for a moderately handicapped student. Therefore, the marginal cost of additional mildly handicapped students (the likely result of a broad definition of handicapping conditions) would be less than the average cost for existing students. What the actual costs would be, however, would depend upon the specific handicapping conditions involved and the programs and services provided to those students.

How many students will be served by special education is another important aspect affected by the classification system. Estimates of the number of handicapped students needing special education are generally expressed as incidence rates (i.e., the percentage of students with a given handicapping condition in the general population). They usually reflect three different components: the number of handicapped children already being served (known population); the number of handicapped children who have been identified, but are awaiting service (known population); and an estimate of the number of handicapped children who may exist in the general population, but are unidentified (unknown population). It is this last component that is subject to great differences of opinion and judgment and is most affected by the classification system.

The population to which incidence rates are applied is also an area of difference. Use of public school enrollments, public and private school enrollments, or census age groupings (e.g., ages 5-17) will yield different results. Perhaps even more significant is the lack of homogeneity of the appearance of handicapping conditions across age groups. In two of the largest categories, speech and specific learning disabilities, there is a much higher rate of occurrence in the primary grades and a sharp dropping off by the secondary level.[58] These changes are due to improvement or correction of the disability through special education programs and/or developmental maturation of students. Other categories, such as physical handicaps, tend to be more constant in their occurrence across age groups, although the appropriate special education services may change for these students over time. In any event, a single incidence rate for a handicapping condition reflects (or should reflect) an average rate of occurrence over the population and age grouping in question. Such a number generally has a substantial amount of uncertainty associated with it.

In spite of the importance of reliable incidence rate information to program and fiscal planning and operation, dependable data on the occurrence of children with handicapping conditions needing special education are lacking. As described in a recent review of issues related to special education finance,

> Most estimates are based partly on empirical evidence and partly on the judgement of the estimator. The most frequently quoted estimates

> seem to take on an aura of authenticity due more to the fact that they appear to be the only available source than to their validity.[59]

Wide ranges are found in reported incidence rates, even among the same handicapping conditions; variations of 100% or greater are not uncommon. A recent survey of incidence rate literature derived a range of estimated - national rates for school age children; the estimates went from a low of 6.525% to a high of 13.65%. The impact on the estimated costs to provide all handicapped children with an appropriate education of half or twice the number of such children are obviously enormous. For comparison, the Bureau of Education for the Handicapped (BEH), U.S. Office of Education has an estimate of 12.035%.[60] (See Table 2.5)

In recent years there has been some movement away from the use of the medically oriented disability labels toward classification systems that are of more relevance to the special educational needs of the child.[61] Since the late 1960s, there has been a growing dissatisfaction with the traditionally medical and psychological based categories in common use, particularly their irrelevance to educational needs of children and educational decisions of teachers and administrators. The trends that appear to be emerging, although not widely implemented as yet, are:

1. Use of educational or learning needs of the child as the basis for any categorization.[62]

TABLE 2.5

RANGE OF ESTIMATED NATIONAL RATES OF CHILDREN OF SCHOOL AGE (AGES 6 TO 17) IN NEED OF SPECIAL EDUCATION BY MAJOR HANDICAPPING DISABILITY
(Per 100 Students)

Major Handicapping Disability	Range of Estimated Rates		BEH Estimates (Ages 6-19)
	Low	High	
Mentally Retarded	1.3	2.3	2.3
Hard of Hearing	0.3	0.5	0.5
Deaf	0.075	0.19	0.075
Speech Impaired	2.4	4.0	3.5
Visually Handicapped	0.05	0.16	0.1
Emotionally Disturbed	1.2	2.0	2.0
Orthopedically Impaired	0.1	0.75	0.5
Other Health Impaired	0.1	0.75	
Specific Learning Disabled	1.0	3.0	3.0
Total:	6.525	13.65	12.035*

Source: David H. Kaskowitz, _Validation of State Counts of Handicapped Children_, vol. 2: _Estimation of the Number of Handicapped Children in Each State_ (Menlo Park, CA, Stanford Research Institute, 1977), p. 32.

* Includes 0.06% in Deaf-Blind and other multiple handicapped not included in other categories.

2. Inclusion of educationally relevant variables in the classification process.[63]

3. Broadening of categories into more comprehensive and less narrow definitions (e.g., learning and behavior disordered, sensory handicapped, and communication impaired).[64]

4. Individualized program planning resulting in more concern with determining the appropriate educational program for a child than a handicapping label.[65]

5. Use of teaching techniques (e.g. behavior management concepts) and educational programming (e.g., mainstreaming) which cut across categories.[66]

6. Funding for special education based on the services needed to meet the needs of handicapped children rather than on a categorical basis.[67]

7. Non-categorical teacher training programs.[68]

8. Greater parental involvement in the labeling and placement decisions concerning their children.[69]

However constructed, any classification system for handicapped chldren should meet three basic objectives; 1) group students in educationally relevant categories; 2) associate pupils with appropriate special education (and other) programs and services; and 3) be efficient and avoid unnecessary complexity, but be adequate for data analysis, program administration and planning, funding, and public support.[70]

Special Education Programs and Services

Special education was previously described as the set of educational programs and services which is directed toward meeting the educational needs of handicapped children. Within this broad characterization, the programs and services can be separated into two major divisions--instructional programs and supportive or related services. At the state level, special education is frequently used as an umbrella term encompassing both instructional programs and related services. At the federal level, the term "special education" is used to designate programs that are instructional in nature,

> . . . specially designed instruction, at no cost to the parent, to meet the unique needs of a handicapped child, including classroom instruction, instruction in physical education, home instruction, and instruction in hospitals and institutions.[71]

while related services are defined as,

> . . . transportation and such developmental, corrective, and other supportive services as are required to assist a handicapped child to benefit from special education, and includes speech pathology and audiology, psychological services, physical and occupational therapy, recreation, early identification and assessment of disabilities in children, counseling services, and medical services for diagnostic and evaluation purposes. The term also includes school health services, social work services in schools, and parent counseling and training.[72]

There has evolved in the field of special education the programming concept of having available a continuum of educational programs and services for handicapped children.[73]

The possible options range from placement in a regular classroom with only minimal special education support for a handicapped child and/or the regular teacher, to programs where the child receives specialized instruction for part or all of a school day, to residential programs providing full-time total care for handicapped children. Listed below is one such array which is representative of the full range of appropriate educational and educationally related programs and services for handicapped children.[74] The programs and services are grouped according to the primary means or setting for providing instruction.

- Regular class with assistance
  - Indirect services to the regular teacher
  - Special education instructional materials and equipment
  - Consultive services to the regular teacher
  - Direct instruction by special education specialists
  - Resource room program
  - Related services
- Separate class within the regular school
  - Part-time special class
  - Full-time special class
- Separate day school
  - Special public school
  - Other public agency facility
  - Private school facility

Residential school

  - Special public school
  - Other public agency facility
  - Private school facility

Other educational environments

  - Hospital programs
  - Homebound instruction

It is important to note that the programs listed above are not mutually exclusive. Depending on their individual needs, handicapped children may receive or be provided several programs or services simultaneously. For example, a mentally retarded student in a full-time special class may also be instructed by a speech and language specialist three times a week. Or a child in a resource room program may also be provided with psychological counseling services.

It is also important to recognize that special education is a dynamic process. Handicapped children's needs change as they grow and learn. Some children can be returned fully to regular education after being in a special education program for a time. Others may need special education services for only a portion of their time in school. For example, speech and language instruction, one of the largest special education programs, serves primarily elementary school children since most of the children needing these services are either helped to overcome their speech problem through instruction or develop out of the speech problem by the time that they reach the secondary level.[75] Other children may remain in some form of special education program for their entire school career, but the type of program that is appropriate for them may change. An example of this process would be movement over time of an emotionally disturbed student from a full-time special class to a part-time special class to a resource room placement.

The above listing of programs and services can also be used to illustrate the concept of least restrictive environment. They are arranged generally so that as one progresses down the list, the programs change from less restrictive to more restrictive. Toward the top of the list, handicapped children receive all or most of their education with non-handicapped children; moving down, the handicapped children become increasingly separated and isolated from their non-handicapped age peers.

The hierarchal arrangement also illustrates several important relationships between the handicapped children and the programs and services that they receive. The complexity of educational needs increases from top to bottom. Children with milder handicaps can be served with regular class or separate class placements. Children with more severe handicaps require more extensive services provided by separate facilities. Further, the number of children served by or needing the services of each program decreases from top to bottom. Programs toward the top serve relatively large numbers of mildly handicappped children. Programs toward the bottom serve progressively fewer, but more severely handicapped children.

The compositions of the programs change correspondingly to meet the educational needs and numbers of handicapped children. Handicapped children in programs toward the top consume relatively low quantities of resources (e.g., personnel, instructional materials, facilities, etc.); these children receive a relatively small proportion of special education services in addition to their regular education program. The intensity of special education services is greatly increased in programs toward the bottom of the list as special education may entirely replace regular education for children in these programs. It is the concentration of resources that varies across these programs. As programs become more separate, student-teacher ratios decline, additional materials and equipment are needed, special facilities are required, and there are fewer children who receive these services.

All of these aspects have a direct bearing on the costs of special education. The cost per student for special education increases as one moves down the hierarchy. The relatively low use of resources combined with a larger number of students results in a lower cost per student for programs toward the top. At the other end, increased use of resources for fewer students yields a higher cost per student. However, the programs at the top of the hierarchy may have a higher total cost since there are many more students in these programs.

It is through this process then that the total cost of special education is determined--by the choice of programs and services provided to handicapped students. The choices of which programs and services to provide for which handicapped students result in a demand for certain quantities of special resources. The prices of these resources when purchased and then totaled lead to the costs of special education. Thus, as stated by a recent study of special education finance, "Instructional programming is the crucial factor in any consideration of special education finance, since the various combinations of resources and methods constituting special education programs are what must be financed."[76]

However, future programming practices may differ substantially from past ones. Significant uncertainty exists in estimating the impact of program changes which will actually occur in order to meet the requirements of the new laws and associated regulations. For example: Will the mandated child-find efforts to locate unidentified handicapped children be thorough or perfunctory? How many additional children will be found in need of special education? What types of program placement patterns will be utilized? What will the emphasis on the least restrictive environment mean in terms of placement of new students and shifting of existing students among special education programs. Will new types of programs and services be offered and will the composition of resources used in present programs be changed? The pressures and requirements of the new laws will cause programmatic changes, to be sure, but the extent of the changes in future special education policies and practices is uncertain. However, since special education costs are a function of the actual programs and services provided to handicapped children, estimation of the specific programmatic practices and conditions for the future state toward which special education is moving--providing all handicapped children with an appropriate education--is essential to projecting future special education costs. Further, because the exact nature of the future programmatic conditions of special education is uncertain, any approach for estimating future costs of special education must be capable of varying the major programmatic assumptions and determining the resultant impact on costs. In sum, any estimate of the future costs of special education is directly conditional upon the programmatic assumptions defining the students to receive special education, the programs and services to be provided, and their relationships.

Notes for Chapter II

1. Surprisingly, there are relatively few definitions of special education per se in the literature. Those listed below represent a variety of different viewpoints: academic, federal, state. See Peggy Larson and Beverly Melugin, "Politically Active Parent Groups of Handicapped Children: A Study in Participatory Democracy" (Masters Thesis, University of Oregon, 1974), p. 34; U. S. Department of Health, Education, and Welfare, "Education of Handicapped Children," Federal Register 42, No. 163, 23 August 1977, 42480; Hawaii Department of Education, *State Plan for Special Education and Services* (Honolulu: Hawaii Department of Education, 1975), pp. 12-13; Arkansas Department of Education, *State Plan for Special Education* (Little Rock, Ark.: Arkansas Department of Education, 1975), p. 8; and Lloyd M. Dunn, ed., *Exceptional Children in Schools: Special Education in Transition*, 2nd ed. (New York: Holt, Rinehart, and Winston, 1973), pp. 7-8.

2. See Peggy Larson, "Teachers' Descriptions of Referral Children: School Years 1970-72," Working Paper No. 18 (Eugene, Oregon: Regional Resource Center for Handicapped Children, University of Oregon, 1972) for regular teachers comments on children with suspected handicapping conditions in their classes.

3. National School Public Relations Association, *Educating Children with Special Needs* (Arlington, VA: National School Public Relations Association, 1974), p. 30; and Edwin W. Martin, "New Public Priority: Education of Handicapped Children," in *The Education of Handicapped Children*, Report No. 23, eds. Gene Hensley and Nancy Cain (Denver: *Education Commission of the States*, 1972), p. 1. Similar findings are also reported in the Education for All Handicapped Children Act of 1975 in the Statement of Findings and Purpose (20 U.S.C. 1401 note).

4. For example, see R. P. Mackie and L. M. Dunn, *College and University Programs for the Preparation of Teachers of Exceptional Children*, Bulletin No. 13 (Washington, D.C.: U. S. Office of Education, 1954), p. 3; or David Kaskowitz, *Validation of State Counts of Handicapped Children*, vol. 2: *Estimation of the Number of Handicapped Children in Each State* (Menlo Park, CA: Stanford Research Institute, 1977), pp. 30-33.

5. For a comprehensive review of all relevant litigation involving the education of handicapped children, see Alan Abeson and Nancy Bolick, eds., *A Continuing Summary of Pending and Completed Litigation Regarding the*

Education of Handicapped Children (Reston, VA: The Council for Exceptional Children, 1974).

6. Empress Young Zelder, "Public Opinion and Public Education for the Exceptional Child--Court Decisions 1873-1950," Exceptional Children 19 (February 1953): 187.

7. Ibid., pp. 193-194.

8. Frederick Weintrub and Alan Abeson, "Appropriate Education for All Handicapped Children: A Growing Issue," Syracuse Law Review 23 (1973): 1045.

9. Freeman v. Franklin Township, 37 Pa. St. 385; and Williams v. Board of Education, 79 Kan. 202, 99 Pac. 216, 22 L.R.A. (N.S.) 584, cited in Zelder, "Court Decisions," p. 188.

10. Pennsylvania Association for Retarded Children v. Commonwealth of Pennsylvania, 334 F. Supp. 1257 (E.D. Pa. 1971); and 343 F. Supp. 279 (E.D. Pa. 1972).

11. For a thorough discussion of this case, see Leopold Lippman and Ignacy Goldberg, Right to Education: An Anatomy of the Pennsylvania Case and Its Implications for Children (New York: Teachers College Press, 1973).

12. Mills v. Board of Education of District of Columbia, 348 F. Supp. 866 (D.D.C. 1972).

13. Id. at 875.

14. Diana v. State Board of Education, No. C-70-37 (RFP) (N.D. Cal. July 1970 and May 1974).

15. Larry P. v. Riles, No. C-71-2270, 343 F. Supp. (N.D. Cal. 1972).

16. Abeson and Bolick, eds. A Continuing Summary.

17. For example, see Burres v. Wilkerson, Civil Action No. 68-C-13-4 (W.D. Va., May 23, 1969), affirmed per curram, U.S. Supreme Court, February 24, 1970; and McInnis v. Shapiro, 293 F. Supp. 327 (N.D. Ill. 1968), affirmed sub nom McInnis v. Ogilvre 384 U. S. 322 (1969).

18. See David L. Kirp, "Law, Politics, and Equal Educational Opportunity: The Limits of Judicial Involvement," Harvard Education Review 47 (May 1977) for a detailed analysis of the present role of the court vis-à-vis the political system.

19. Steven Goldschmidt, "Implications of Recent Court Decisions," *Oregon School Study Council Bulletin* 18 (January 1975): 27-29.

20. Kirp, "Law, Politics, and Equal Educational Opportunity," p. 135.

21. For a summary of the statutory provisions of each state see "State Statutory Responsibilities for the Education of Handicapped Children, July 1, 1975," a chart prepared by The Development and Evaluation of State and Local Special Education Administrative Policy Manuals Project of the State-Federal Information Clearinghouse for Exceptional Children of the Council for Exceptional Children.

22. Kirp, "Law, Politics, and Equal Educational Opportunity," pp. 121, 135.

23. David L. Kirp, Peter J. Kuriloff, and William G. Buss, "Legal Mandates and Organizational Change," in *Issues in the Classification of Children*, vol. 2, gen. ed. Nicholas Hobbs (San Francisco: Jossey-Bass, 1975), pp. 362-379.

24. Education of All Handicapped Children Act of 1975, 89 Stat. 775 (1975).

25. See Alan Abeson and Jeffery Zettel, "The End of the Quiet Revolution: The Education for All Handicapped Children Act of 1975," *Exceptional Children* 44 (October 1977): 115-128 for a discussion of the issues confronting implementation of P.L. 94-142.

26. Dunn, ed., *Exceptional Children in Schools*, 2nd ed., pp. 41-50. Also see William M. Cruickshank and G. Orville Johnson, eds., *Education of Exceptional Children and Youth*, 2nd ed. (Englewood Cliffs, N.J.: Prentice-Hall, 1976), pp. 11-14.

27. R. W. Heiny, "Special Education: History," in *The Encyclopedia of Education*, vol. 8 (New York: Macmillan & The Free Press, 1971), p. 344.

28. Wayne D. Lance, "Who Are All the Children?" *Exceptional Children*, vol. 43 (October 1976): 69.

29. E. A. Fay, ed. *Histories of American Schools for the Deaf*, 1817-1893, vol. 1 (Washington, D.C.: The Volta Bureau, 1893), cited by Lance, "Who Are All the Children," p. 66.

30. G. Farrell, *The Story of Blindness* (Cambridge, MA: Harvard University Press, 1956), cited by Lance, "Who Are All the Children," pp. 66-67.

31. Cruickshank and Johnson, *Education of Exceptional Children and Youth*, p. 11.

32. Leo Kanner, "Itard, Segurn, Howe--Three Pioneers in the Education of Retarded Children," in *Exceptional Children: Educational Resources and Perspectives*, eds. Samuel A. Kirk and Francis E. Lord (Boston: Houghton Mifflin, 1974), pp. 219-222.

33. Ibid., pp. 222-223.

34. Dunn, ed., *Exceptional Children in Schools*, 2nd ed., p. 41.

35. Cruickshank and Johnson, *Education of Exceptional Children and Youth*, p. 30.

36. A. Flowers and C. E. Bolme, *Law and Pupil Control* (Cincinnati: W. H. Anderson, 1964), cited by Dunn, ed., *Exceptional Children in Schools* 2nd ed., pp. 41-42.

37. These examples have been drawn from Cruickshank and Johnson, *Education of Exceptional Children and Youth*, pp. 12-14; and Dunn, ed., *Exceptional Children in Schools*, 2nd ed., pp. 44-45.

38. Cruickshank and Johnson, *Education of Exceptional Children and Youth*, pp. 12-28.

39. Joseph H. Levy, *Parent Groups and Social Agencies* (Chicago: University of Chicago Press, 1951), p. 11.

40. For a review of parent group activities, see Larson and Melugin, "Politically Active Parent Groups," pp. 49-52.

41. See Edwin W. Martin, "Breakthrough for the Handicapped: Legislative History," *Exceptional Children* 34 (March 1968): 493-503, for a description of the federal legislative activity affecting special education through 1967.

42. U. S. Department of Health, Education, and Welfare, "Education of Handicapped Children," *Federal Register* 42, No. 163, 23 August 1977, p. 42497.

43. *Special Education Reporter*, November 1977, p. 1.

44. For a more thorough description of mainstreaming, see Herbert Prehm, "Basic Concepts in Mainstreaming Exceptional Children," *Oregon School Study Council Bulletin* 18 (December 1974); and Nancy Kreinberg and Stanley Chow, *Configurations of Change: The Integration of Mildly Handicapped Children into the Regular Classroom* (San Francisco: Far West Laboratory for Educational Research and Development, 1973).

45. For the most comprehensive and thorough examination of the classification of handicapped children presently available, see Nicholas Hobbs, gen. ed., *Issues in the Classification of Children*, 2 vols. (San Francisco: Jossey-Bass, 1975).

46. Ibid., p. 17.

47. Ibid.

48. For discussions of the history, development, and key persons involved for each of the major handicapping categories, see: Norris G. Haring, ed., *Behavior of Exceptional Children: An Introduction to Special Education* (Columbus, Ohio: Charles E. Merrill Publishing, 1974); Kirk and Lord, eds., *Exceptional Children: Educational Resources & Perspectives*; Hobbs, gen. ed., *Issues in the Classification of Children*, vol. I; and Merle E. Frampton and Hugh G. Rowell, *Education of the Handicapped*, vol. 1: *History* (Yonkers-on-Hudson, NY: World Book Co., 1938).

49. Hobbs, gen. ed., *Issues in the Classification of Children*, vol. II, pp. 39-42.

50. Ibid., pp. 42-52.

51. Dunn, ed., *Exceptional Children in Schools*, 2nd ed., p. 10.

52. Ibid.

53. Maynard C. Reynolds and Bruce Balow, "Categories and Variables in Special Education," *Exceptional Children* 38 (January 1972): 357.

54. Francis E. Lord, "Categories and Mainstreaming in Special Education: Perspectives and Critique," in *Exceptional Children: Educational Resources and Perspectives*, eds. Kirk and Lord, p. 422.

55. U. S. Department of Health, Education, and Welfare, "Education of Handicapped Children," *Federal Register* 42 No. 162, 23 August 1977, p. 42478.

56. California State Department of Education, *California Master Plan for Special Education* (Sacramento: California State Department of Education, 1974), pp. 23-24.

57. Hawaii Department of Education, *State Plan for Special Education and Services*, pp. 14-15.

58. Forrest M. Hull, et al., *National Speech and Hearing Survey* (Washington, D.C.: U. S. Office of Education, 1976), pp. 102-111.

59. Charles D. Bernstein, et al., *Financing Educational Services for the Handicapped: An Analysis of Current Research and Practices* (Reston, VA: The Council for Exceptional Children, 1976), p. 32.

60. Kaskowitz, *Estimation of the Number of Handicapped Children in Each State*, p. 32.

61. Dunn, ed., *Exceptional Children in Schools*, 2nd ed., p. v.

62. Ibid., p. 11.

63. Maynard C. Reynolds and Bruce Balow, "Categories and Variables in Special Education," *Exceptional Children* 38 (January 1972).

64. James Moss, "Trends and Issues," in *Behavior of Exceptional Children*, ed. Norris G. Haring, p. 577.

65. *The Futures of Children: Categories, Labels, and Their Consequences* (Nashville, Tenn.: Center for the Study of Families and Children, Vanderbilt University, 1975), pp. 24-26.

66. Moss, "Trends and Issues," p. 576.

67. *The Futures of Children*, p. 24.

68. Oliver L. Hurley, "The Categorical/Non-Categorical Issue: Implications for Teacher Trainers," in *Exceptional Children: Educational Resources and Perspectives*, eds. Kirk and Lord, pp. 440-49.

69. Hobbs, *Issues in the Classification of Children*, vol. 2, pp. 421-23.

70. California State Department of Education, *Master Plan*, p. 23.

71. U. S. Department of Health, Education, and Welfare, "Education of Handicapped Children," pp. 42480.

72. Ibid., pp. 42479-80.

73. See: Maynard C. Reynolds, "A Framework for Considering Some Issues in Special Education," *Exceptional Children* 28 (March, 1962): 367-370; Evelyn Deno, "Special Education as Developmental Capital," *Exceptional Children* 37 (November, 1970): 221-252; Samuel A. Kirk, *Educating Exceptional Children*, 2nd ed. (Boston: Houghton Mifflin, 1972); and Richard A. Rossmiller, "Financing Educational Programs for Handicapped Children," in *Financing Educational Programs for Handicapped Children*, ed. Nancy Cain (Denver: Education Commission for the States, 1974).

74. The set of programs listed represent a composite taken from three recent sources: Peggy L. Hartman, et al., *Special Education Planning Model: User Guide* (Palo Alto, CA: Management Analysis Center, 1978); and U. S. Office of Education, "Fiscal Year 1978 Annual Program Plan Amendment for Part B of the Education of the Handicapped Act as Amended by Public Law 94-142," Table 4--Least Restrictive Environment (Washington, D.C.: Government Printing Office, 1977); and Dunn, ed., *Exceptional Children in Schools*, 2nd ed., chap. 1.

75. Hull, et al., *National Speech and Hearing Survey*, pp. 102-111.

76. Bernstein, et al., *Financing Educational Services for the Handicapped*, p. 1.

CHAPTER III

ECONOMIC APPROACHES TO COST ESTIMATION

The previous chapter has investigated factors and issues affecting the costs of special education from the perspectives of the development of special education, the reasons for its rise to prominence, and the relationship of programmatic factors to costs. This chapter examines two theoretical approaches for determining costs from the field of economics. These two different conceptual frameworks for measuring costs are reviewed and their general applicability for estimating and projecting future costs in education is evaluated. Then, the potential of these economic concepts to aid the estimation of future costs for special education is considered.

The two approaches are: 1) the use of a representative firm as a proxy for the cost structure of an industry; and 2) the construction of a production function to represent mathematically the relationship among the input factors, the output produced, and the costs of production.

Representative Firm

This approach was proposed by Alfred Marshall in Principles of Economics.[1] The concept was presented as a means of deriving the normal cost of production of a commodity in an industry at a given aggregate volume. The expenses of the representative firm are used as a standard in estimating the normal expenses of production for the industry as a whole.

The representative firm, as its name suggests, is meant to be characteristic of an entire industry. As such, it is described as having fairly long life, fair success, managed with normal ability, and with normal access to the internal and external economies of the industry. The internal economies are those resulting from the firm's own resources and size, while the external economies are those which result from the size of the entire industry. The representative firm, then, exhibits the average internal and external economies present in the industry. It avoids the extremes of a small, new, or inefficient producer, as well as of a large, long-established firm with efficiencies superior to the industry.

This is an overall, industry-wide view. It is not concerned with individual firms since they are not typical of the industry and their costs cannot be generalized with validity. Furthermore, changes in individual firms do not change the normal cost of production in the industry so long as the aggregate volume of the industry remains constant. This is because the aggregate volume is the key determinant of the size of the representative firm and of the internal and external economies it experiences. These, in turn, determine the normal costs of production of the representative firm and, hence, the industry.

Throughout his discussion of the representative firm, Marshall is concerned primarily with the long run marginal costs as the means for estimating future industry costs. The use of the long run time period allows the industry and the representative firm to vary the resources employed (increase, decrease, modify current utilization patterns) to match the expected volume to be produced over the long run. The short run is not used as the appropriate time period since in the short run the production process is limited (by definition) to the existing stocks of plant, personnel, and other resources (although the patterns of utilization of these existing resources may be modified to reach greater efficiencies). Thus, the use of the long run time period allows the production process and the resultant production costs to adjust to meet the expected market conditions.

The normal costs of production for the representative firm are not necessarily the average costs; except under static market conditions, they will differ. The average costs are simply mathematical calculations which indicate historical occurrences. Normal costs are those which are expected for a given set of market and production conditions. The expected conditions for the normal costs usually differ from the unique actual conditions which yield the average costs. Further, average costs tend to reflect short run production results which may be changed substantially in the long run if the future normal conditions differ from those of the present or recent past.

How is a representative firm identified and chosen? Marshall is not specific on this crucial step. The general procedure is to survey the firms in the industry, taking note of their respective volumes, internal and external economies, and costs of production. Then select the firm most characteristic of the industry. Any changes over time in the size and efficiences of the representative firm are assumed to be gradual and to arise out of aggregate volume changes and adaptations of existing ideas in the industry. Substantive new inventions which affect the output volumes or economies of the representative firm and the industry are excluded from consideration. Rather it is assumed that the normal conditions toward which the representative firm and the industry are moving are those of long run dynamic equilibrium, where the changes in individual firms are balanced and compensate for each other when considering the industry as a whole.

How applicable is the concept of a representative firm to education? Can it provide assistance in the task of estimating future costs of special education? To begin with, there are significant differences between the private industrial sector for which the representative firm concept was formulated and the educational system. A market economy does not really operate in education. The school district or "firm" has a legal territorial monopoly. While there is limited competition from private schools, their effect is usually small. The absence of meaningful competition and the certainty of a guaranteed market assured by compulsory attendance laws result in a lack of incentives for efficient production normally found in the private sector. Therefore, the costs of production may well be higher than if education functioned in a market economy. However, this does not necessarily affect the use of the concept of a representative school, school district, or educational system to represent the normal production costs of the education industry. The concept does not require that the representative firm be operating at a minimum point on the average cost curve, but rather that it be indicative of the industry as a whole, including both efficient and inefficient producers. The concept could still apply even if the normal costs of production of a representative school (and hence the educational system) were higher than the costs would be with efficient production.

There appear to be more difficulties in applying the assumption of an industry to the educational system. The production processes in both education and special education are not uniform. There are wide variations among and within states and school districts in the types of programs provided and in the content of those programs. The products being produced are not defined in similar fashions across jurisdictions and there is a lack of adequate output measures to determine what is being produced.[2] Further, there are many different products being produced by the educational system, some of which are not comparable with each other--cognitive abilities, social attitudes, annual graduates of each level. The output of an industrial firm or industry is generally considered as a certain measurable quantity of a given commodity with specific characteristics or level of quality. Even if quantity measures for education could be established (e.g., number of graduates, number of children enrolled), there are no satisfactory measures of quality. Without some control for quality in education it is not possible to ascertain if the products being compared, aggregated, or otherwise analyzed are indeed comparable, additive, or even related to each other. Therefore, identification of a representative firm for special education may not be feasible, particularly the specification of an actual state or school district which represents nationwide "normal" special education practices and costs.

As discussed in Chapter II, major changes are occurring in special education programs and practices and are expected to continue. This period of time can be more accurately described as a somewhat abrupt transition than as a gradually adjusting dynamic equilibrium. Thus, it becomes much more difficult to specify what normal conditions for special education will be in the future. However, through an active network of conferences, professional associations, journals, and other dissemination activities, there is widespread information available to the "production managers" of special education at all levels (e.g., district superintendents and supervisors, principals, teachers, state department administrators and consultants) on current and potential special education practices. Faster diffusion of successful practices can lead to greater uniformity of future programs. With the long run perspective, the current and anticipated changes in special education can be viewed as short run fluctuations. If it were possible to identify, even broadly, the normal conditions expected for special education at the end of this transition, these would be the conditions upon which the costs of production should be estimated using this approach. The data necessary to specify these conditions would include the types and numbers of handicapped children served in special education, the programs provided, the mix of programs and resources to be utilized, and the educational effectiveness of these programs. Further, the use of the expected normal costs rather than historical average costs would avoid the difficulties associated with projecting future costs from past cost data when the conditions have changed significantly.

The use of long run marginal costs is appropriate for estimating the costs of expansion of special education programs and services; although with substantial expansion of special education required to serve all handicapped children, the increments of program additions are likely to be large. Therefore, it is probable that the existing cost relationships could be altered significantly. Many of the costs considered fixed within a small increment would become variable with a program growth of fifty to one hundred percent. As a result, it would be necessary (as does the representative firm approach) to consider the total process of production--the entire special education program--as the marginal unit and to include the programmatic and cost relationships among the various components of the total program in an analysis of this type.

In sum, it appears that the concept of the representative firm may have some applicability in the estimation of future costs of special education. However, as noted by Marshall, it must be taken broadly. Its use would include identification of the common features of special education programs across states and school districts, establishment of the normal conditions of special education expected to be reached following the current transition period, and the use of anticipated normal program costs to project the total costs of educating all handicapped children. At the same time, it appears unlikely that an actual school district's or state's overall special education program would be found sufficiently representative of all special education programs to function in the same manner as the representative firm. As a result, the representative firm, if utilized as an approach to estimating costs, would in all likelihood have to be a theoretical composite of anticipated special education programs and practices.

Production Function

With the production function, education is considered to be a production process in which certain inputs are combined to produce educational outcomes. This interpretation of education is modeled after the production process in a business firm and draws upon the large body of theoretical and empirical knowledge which exists for the economics of production. From the standpoint of economic theory, there are three principal problems of production which must be resolved: 1) Technical problems of production, in which the quantitative relationships between the input factors and the output of the production process must be specified. In other words, what is the nature of the production process itself? In manufacturing firms this is generally specified through engineering data and formulas. 2) Cost problems which involve the relationships between the costs of the various inputs and the quantity of the outputs. These problems relate to the state of technical knowledge of the production process and possible alternative combinations of input factors, the available supply of each of the input factors, and the accessibility of capital funds. 3) Maximization problems of production in which the firm attempts to maximize its objective, subject to the constraints imposed by the demand for its products, existing technical knowledge, and the supply and cost of both input factors and capital funds. In the business firm this usually takes the form of maximizing the firm's profits or the net return on the firm's capital.[3]

The central economic concept employed is that of the production function. The general formulation of the production function is shown in equation 1, in which the output of the firm is expressed as a function of the inputs or resources used in the production process.

$$\text{Output} = f(\text{input}_1, \text{input}_2, \text{input}_3, \ldots, \text{input}_n) \qquad [1]$$

The production function represents the technological relationship between a given set of input factors in a production process and the maximum possible level of output which can be obtained from those factors. Consequently, the production function represents the production frontier in an industry.

In the estimation of a production function, time is implicitly assumed to be constant. The production process used is the most efficient one that is presently available, given the state of the relevant technical knowledge. However, most industries are in a constant state of technical and economic change--new production techniques are developed and there are changes in the prices of the input factors. As a result, the most efficient, least costly, and best-practice techniques will exhibit a steady advance. Large changes, involving significant capital expenditures or major changes to the production process, tend to be made relatively infrequently by any single firm in an industry. Further, factor prices change over time resulting in alterations to the relative feasibilities and cost-efficiencies among the various production techniques available to firms in an industry. Therefore, the best-practice techniques adopted by firms in one year may not be those adopted by different firms in the next year. This process of technical change in an industry--continual disturbance and slow adjustment--results in a series of production functions being present at any one time in an industry.[4] It means that only a fraction of the firms in the industry could be operating in the most cost-effective manner or on the production frontier at any given time. It also means that use of statistical data from a sample of firms in an industry is not appropriate for estimating the production function of the industry since the data will yield average, not frontier results.

In its application to education, the production function has the same general form as equation 1, but the outputs are measures of educational outcomes and the inputs represent the set of factors which are thought to be important to the educational process. Levin provides a general formulation of the educational production function which is common to both the theoretical and empirical studies in this area.[5]

$$A_{it} = G\,[F_{i(t)}, S_{i(t)}, P_{i(t)}, O_{i(t)}, I_{it}] \qquad [2]$$

The i subscript refers to the ith student; (t) refers to an input that is cumulative to time t.

A_{it} = a vector of educational outcomes for the ith student at time t.

$F_{i(t)}$ = a vector of individual and family background characteristics cumulative to time t.

$S_{i(t)}$ = a vector of school inputs relevant to the ith student cumulative to t.

$P_{i(t)}$ = a vector of peer or fellow student characteristics cumulative to t.

$O_{i(t)}$ = a vector of other external influences (the community, for example) relevant to the ith student cumulative to t.

I_{it} = a vector of initial or innate endowments of the ith student at t.

There have been a number of recent efforts to estimate educational production functions.[6] These studies have collected data on both input factors and educational outcomes from a large number of schools and educational systems. Specific input factors have included measures or proxy measures of individual student characteristics (e.g., age, sex, motivation), family background (e.g., family size, father's education, mother's employment status), school characteristics (e.g., teacher experience, teacher turnover, library volumes). The output measures have almost invariably used pupil scores on standardized achievement and/or ability tests as the sole measure of educational outcomes. The studies then utilized multivariate statistical techniques to identify statistically significant relationships between input and output variables. Of the school input factors, teacher characteristics generally have been found to have the greatest impact on the associated student test scores. However, these studies have a number of difficulties which limit the use of their findings, particularly for educational policy making and resource allocation decisions.

For use in estimating the costs of education, the school inputs (e.g., teachers, aides, administrators, instructional materials, etc.) are of primary importance. These items have prices associated with them and must be purchased within the school budget. The direct costs of education (and the school budget) are equal to the sum of the price times the quantity for each resource employed.

$$\text{Cost} = P_1X_1 + P_2X_2 + P_3X_3 + \ldots + P_nX_n \qquad [3]$$

where P_1 represents the unit price of X_1, and so forth.

The problem then becomes one of selecting a mix of inputs which maximizes the educational outputs given the budget limitation. This is the definition of the educational production function. The theoretical solution is accomplished by purchasing the inputs in such proportions that the marginal product/price ratios are equal for all inputs at the point that the budget constraint is reached.[7] Thus, the use of the educational production function together with the budget constraint allows estimation of the minimum costs required to reach certain levels of educational output.

While conceptually the educational production function may be a logical representation of the educational process, there are significant difficulties in its application. Similar to the representative firm, the original concept of the production function was developed for use in the private sector. As such, there are a number of assumptions embedded in its formulation which are neither appropriate nor valid for education.

Primary among these is the definition of the production function--that the outputs obtained with a given set of inputs are at the maximum possible level. This implies that the educational enterprise is an output maximizing organization. However, schools do not operate in a competitive market environment and typically are not pressured to maximize their output. This means that most schools do not operate on the production frontier for their outputs; rather they function in a less than optimal manner. The impact of constructing a frontier production function is to limit the use of the results; such a production function will not apply to inefficient schools which predominate in the educational system. In fact the use of a frontier production function to guide the selection and combination of inputs for an average school may result in an even more inefficient operation for that school.[8]

Another immediate difficulty with the application of the production function to education concerns the outputs of education. The production function approach assumes that the outputs to be included are defined, agreed upon, and measurable, and that all outputs of importance are included. Outputs of education present a two-pronged problem; they are both multiple and largely unmeasurable. The educational process produces many student outcomes. Hanushek divides them into the skill aspects (e.g., grades, standard ability and achievement test scores, school retention rates, college continuation rates) and the socialization aspects (e.g., attitudes, values, behavioral norms).[9] However, only those skill outcomes measured by student achievement test scores have been included in the empirical development of educational production functions. Other relevant outcomes have been omitted from consideration.

The use of one outcome (i.e., cognitive abilities) as the sole measure of output when in fact education produces multiple products causes a further problem with use of the production function theory. The educational production function assumes that all schools are operating on the production frontier--producing the maximum possible output (student test scores) with a given set of inputs. However, in the case of joint production, at least some of the efforts or resources in the educational process are devoted to producing outputs other than cognitive abilities. This then would either reduce the level of cognitive abilities produced or require additional resources to reach a given level of cognitive abilities. In either case, the data from existing studies for which educational production functions have been developed do not provide estimates of the production frontier as required by the theory. One solution to this difficulty would be to estimate a series of educational production functions which would include all of the important outputs of the educational process. However, to date this has not proved possible due to the lack of agreement on what the appropriate outputs of education really are, the lack of suitable indicators to measure noncognitive outputs, and the lack of understanding of the relationships among the various outputs and between inputs and outputs. With these critical limitations, the educational production function is misspecified from the outset.

The fundamental assumption of the production function concept is that the nature of the production process is known, and that the relationship between inputs that go into the process and the outputs that result can be specified. For example, certain proportions of iron ore, coke, scrap metal, and other additives when combined at specified temperatures for a given length of time will result in a specific quantity of steel of a predictible tensile strength and hardness. No such specificity is possible with education. There is no adequate learning theory available to explain the educational process.[10] The various resources employed in the educational process are combined in different proportions and structured differently in various schools. What may appear successful in terms of producing the desired results (e.g., higher test scores, increased graduation rates, more student satisfaction, fewer discipline problems) in one situation may not work at all in another. Therefore, it is not possible to identify the effect of any given input on the outcome of the educational process in a consistent and adequately measureable fashion. Without this knowledge school managers can neither allocate their resources in an efficient manner, nor can they predict satisfactorily the effect on the outcomes of education of increasing, decreasing, or eliminating any given input.

The role and functioning of management is a final area of important differences between the business firm and the school which has serious implications for the application of the production function concept to education. As discussed above, school managers have little knowledge of the educational production process. Even for the measurable outputs of standardized test scores, there is an inadequate understanding of how these outcomes are produced and what to do to improve them.[11] Further, there is only limited managerial discretion over the selection, mix, and organization of the inputs utilized. School managers are hemmed in by a variety of constraints which severely limit their flexibility: state and federal statutes and regulations directing revenue amounts and limits, types of expenditures, personnel certification, mandatory programs and practices, and textbooks; growth of teacher associations and collective bargaining; local school board policies; accreditation requirements; and traditional practices. The inflexibility of the use of various inputs limits the substitutability among inputs; this is most prevalent with the widespread and continuing emphasis on a single input--teachers. Since the law of diminishing returns is also assumed to be applicable, the continuing use of personnel resources at the expense of other inputs results in an inefficient production process which is not maximizing its output for a given budget level.

The reward system used in schools is not related to performance outcomes. Compensation is based primarily on length of service and level of education completed, not on student outcomes. There is little personal or financial incentive to increase or maximize these results. In the same vein, the information system of schools does not provide measures of success or failure by which performance can be judged. Changes to the educational production process which might improve its efficiency or increase its output are high risk ventures for managers with little compensating benefits, even if successful.

The educational production function in its standard, theoretical form has significant limitations which greatly restrict its applicability. While the discussion above has been in terms of education generally, the same criticisms would apply to its attempted use in special education as well. However, it would be useful to examine how some of the associated constructs might aid in estimating the costs of special education, particularly future costs.

First, the individual characteristics of the handicapped students (called innate endowments in equation 2) are much more significant in special education than in regular education. Indeed, they are the reasons for the existence of special education. The various handicapping conditions influence the resources utilized and the production process itself, as well as the expected outcomes. For example, different teaching skills, equipment, and techniques are used for deaf children than for emotionally disturbed children. The objectives for different special education students will range from independent, normal functioning to improvement of self-help skills to reduce dependence (e.g., dressing, eating, personal hygiene).

For cost estimation purposes, the frontier estimate of the production function provides a theoretical lower bound on possible costs. It does not represent even an approximation of what present costs are or future costs will be.[12] Estimates based on the actual production process would yield cost estimates of a more realistic magnitude.

The problems related to the definition and measurement of multiple educational outputs appear unmanageable given the present state of knowledge. Besides, the typical outputs used in educational production functions may not be applicable to special education cost estimation. Standardized test scores are often not valid measures of the goals of special education programs. The qualitative outcomes remain largely unmeasurable and their relationships with the inputs into the process are not specifiable. For the purposes of cost estimation, other outputs may be feasible. It is possible to link the school input resources to educational costs through prices and quantities (equation 3). It is then possible to link the costs with intermediate outputs of education defined in terms of units of specific services provided. Such intermediate outputs would include the various programs and services provided and the students served. Inputs would be those items purchased by the school budget. Thomas refers to this formulation as "the administrator's production function."[13]

While the nature of the learning process is not sufficiently understood to specify it in the form of a production function, the nature of the schooling process employed by the educational system certainly is. Specific resources are purchased, combined in certain proportions, and used to provide a desired level of service or output. These relationships can be specified in a production function-like format. For example, teachers, instructional materials, and equipment, facilities, supervisors, etc. (all items identifiable in a school budget with prices and quantities) work together to provide special education programs of various types to a specified number of handicapped students. The prices are determined from the markets for the specific resources. The quantities of each resource required are determined by the rules governing the production process in special education (e.g., student/teacher ratios, use of aides, placement of handicapped students into various programs).

Admittedly, this approach begs the questions of learning outcomes from the schooling process and of the quality of the special education programs provided. There is a critical assumption in this approach that all programs are of sufficient quality and effectiveness that the desired learning outcomes do occur even if the exact workings of the processes are not well known. This assumption, however, is consistent with the nature of the relationships within the school organization and between the school and its community as characterized by Meyer.[14] This view posits that the form of schooling (i.e., students in classes of specified sizes being taught subjects of specified titles by properly certified teachers for certain periods of time) is accepted by school personnel, students, and the community in place of the content of education (i.e., actual learning outcomes). In fact, because the form aspects are measurable, observable, and documentable, they are generally preferred over the difficult to measure content considerations as indicators of performance. In this view, the outputs of importance become the number of students served and a presumed successful educational program (which is defined by the inputs into the educational process and the program standards employed in its operation). Under these conditions, it is possible to specify an educational production function and to determine the costs of such a production process.

There are several trends in special education which tend to buttress the assumptions of program effectiveness and quality and lessen some of the differences with firms functioning in the private sector. There is a growing pressure to achieve acceptable learning outcomes for handicapped children. The federally mandated individual educational program requires schools to identify both the appropriate pedagogical approach(es) for each handicapped student and a timetable of expected results; further, parents may be explicitly involved in establishing and monitoring their child's educational program. As these procedures are implemented, there will be an increasing external force to which schools must respond and demonstrate (through legal proceedings, if necessary) that their programs are appropriate for handicapped students.[15]

The legal, political, and programmatic changes described previously are also opening up choices for school managers in the approaches for serving handicapped students. There are new program options and instructional materials and equipment; the focus on individual needs gives more latitude in the selection and combination of resources. The outside requirements for change lessen the school managers' risks for initiating change. They are freer to change old practices since responsibility for problems which might ensue can be blamed in part on forces beyond their control.

In summary, it appears that neither the representative firm nor the production function approaches are directly applicable in their theoretical or pure forms to the problem of estimating future costs of special education. However, there are aspects and modifications of each which may be of use. The expected normal conditions envisioned in the representative firm concept give a guide to the development of estimates based on future conditions rather than merely extrapolating historical ones. Since a single school district or state is unlikely to be sufficiently representative to serve as the representative firm, the data from an industry survey to investigate the production costs of various enterprises could be used to develop average cost data which, when adjusted for future normal conditions, could provide a more realistic base for cost projections.

By changing the focus of the educational output, a type of production function could be developed for special education which is based on the relationships of the resources utilized by schools and the programs and services providing to handicapped students. These relationships could be used together with the prices of the various resources to estimate the costs of providing the special education programs and services. The two approaches could also be combined by utilizing data of an average or representative nature for both the production process (composition and organization of programs and services to serve handicapped students) and the resource prices in the modified production function.

Notes for Chapter III

1. The following discussion is based on Marshall's descriptions of the nature, purpose, and utilization of the concept of the representative firm. See Alfred Marshall, *Principles of Economics*, 9th (variorum) ed., vol. I: *Text* (London: McMillan, 1961).

2. Reviews of these difficulties are provided in Henry M. Levin, "The Effect of Different Levels of Expenditure on Output," in *Economic Factors Affecting the Financing of Education*, vol. II, eds. R. L. Johns et al. (Gainesville, Fla.: National Educational Finance Project, 1971), pp. 180-81; and James W. Guthrie, "Alternative Concepts of School Efficiency," paper presented at a New York State Education Department Conference on School Efficiency, Albany, New York, 9 June 1977, pp. 6-9.

3. This discussion of the problems of production relies on Sune Carlson, *A Study on the Pure Theory of Production* (London: P. S. King, 1939), pp. 5-8.

4. W. E. G. Salter, *Productivity and Technical Change* (London: Cambridge University Press, 1966), chap. 2.

5. Henry M. Levin, "Measuring Efficiency in Educational Production," *Public Finance Quarterly* 2 (January 1974): 4-5.

6. A listing of these studies is provided in Levin, "Efficiency in Educational Production," p. 4.

7. Levin, "Effect of Different Levels of Expenditure on Output," pp. 177-180.

8. Levin, "Efficiency in Educational Production," pp. 7-12.

9. Eric A. Hanushek, *Education and Race* (Lexington, MA: D. C. Health, 1972), pp. 20-25.

10. Ibid., pp. 15-16.

11. Levin, "Efficiency in Educational Production," pp. 6-7.

12. Salter, *Productivity and Technical Change*, pp. 5-7 provides an industrial example of the large differences between best and average practice productivity.

13. J. Alan Thomas, The Productive School (New York: John Wiley, 1971), pp. 12-13.

14. See John W. Meyer and Brian Rowan, "Notes on the Structure of Educational Organizations: Revised Version," paper prepared for the annual meeting of the American Sociological Association, San Francisco, California, August, 1975.

15. These procedural safeguards are specified in U.S. Department of Health, Education, and Welfare, "Education of Handicapped Children," Federal Register 42, No. 163, 23 August 1977, pp. 42494-98.

CHAPTER IV

COSTS OF SPECIAL EDUCATION

What are the costs of educating all handicapped children? How much money will be required to provide an appropriate special education program for every handicapped child? How can the magnitude of the necessary funding be estimated with reasonable accuracy, given the multitude of uncertainties surrounding the future directions of special education? This chapter investigates the fundamental issues and problems involved in cost determination, estimation, and projection for special education in order to provide a background and understanding upon which to develop answers to these questions. This investigation will be used later as an aid in evaluating a selected cost estimation methodology for special education and in guiding its application to the projection of the costs to educate all handicapped children.

The chapter begins with a summary of the available data concerning total special education expenditures. Next, a general review of the cost concepts and the difficulties facing cost determination efforts in education is presented. The nature of special education costs and how they differ from those of regular education are then examined, followed by a discussion of the types of costs relevant to special education, including the establishment of definitions. Finally, a review of the previous work in this area is given, encompassing both studies of past or present programs and prior efforts at national projections.

Special Education Expenditures

Already, expenditures for special education have reached significant levels in terms of absolute dollars. According to a Rand study,[1] the estimated federal, state, and local expenditures for education of handicapped children in 1972-73 were as follows:

	$ million	%
State and local (1972-73)	$ 2,364.0	90.6%
Federal (FY 1972)	246.0	9.4%
Total	$ 2,610.0	100.0%

As noted by the study, the estimates for the state and local portion, which came from unverified reports and estimates, were not very reliable; they did, however, provide an indication of the magnitude of the total amount of funds being devoted to education of handicapped children.

Since that time, there have been major increases in the amount of funds provided for special education. The comparable funding amounts for 1976-77 are shown below:[2]

	$ million	$
State and local (1976-77)	$ 4,076.3	90.9%
Federal (FY 1976)	409.1	9.1%
Total	$ 4,485.4	100.0%

Over the past four years, the reported expenditures for special education have increased by 72%, with the proportion of the funds being provided by state and local sources and federal sources remaining constant. Another study indicates that expenditures for special education at the state level have grown from $901 million in 1972 to $2,467 billion in 1976, an increase of 171% in five years; this study also estimates the various governmental levels shares of special education costs as: state-55%; local-31%; and federal-14%.[3]

There have also been significant increases in the direct federal support of special education programs. Of the $246 million shown from federal sources in 1972, $37.5 million was budgeted for assistance to state and local educational agencies to support educational and related services for handicapped preschool, elementary, and secondary children (Education of the Handicapped Act, P. L. 91-230, Part B.); the remaining funds were provided through: 1) ESEA - Titles I and III, Headstart, and Vocational Education Amendments; 2) federally operated schools for the deaf; and 3) special assistance such as deaf-blind centers and model early education programs.[4] By 1976, EHA-B appropriations had risen to $110 million. Under P. L. 94-142, which superceded EHA-B, the authorizations for federal support of special education via the state and local grant program were scheduled to increase to $3.16 billion in 1982.[5]

It is not known, however, how these actual and proposed expenditures relate to the total costs required to serve all handicapped children in appropriate special education programs. Levels of state and federal aid to education are a result of a political resource allocation process with no necessary connection to total program needs. For example, the authorization levels for federal aid in P. L. 94-142 were based on increasing percentages of the national average expenditure per pupil for regular education. Their purpose was to establish a limit on the commitments of the federal treasury, not to match an analyzed need for expenditures for special education.[6]

Cost Determination in Education

A fundamental difficulty in determining the costs of education comes from the concept of costs. In economic terms, costs are defined as "the value of benefits foregone."[7] This definition includes both direct costs, which involve expenditures or explicit monetary outlays for the various resources used in the educational process, and indirect or implicit costs, which do not involve expenditures.[8] Typically, educational costs are thought of and reported as direct costs only; these are the tangible outlays or expenditures kept track of by a cost accounting system and reported in an educational budget (e.g., salaries, fringe benefits, supplies, maintenance, and transportation).[9] The indirect costs are not accounted for or reported, although they may represent a majority of the total costs of education. The largest indirect cost item is the value of foregone earnings of students while they are in school;[10] also important are depreciation of buildings (generally not reported), imputed interest on invested capital, and tax exemptions for educational institutions.[11] However, since the indirect costs are theoretical and do not occur as transactions which can be treated by the usual cost accounting systems, in practice they are generally not included when estimating educational costs.

In addition, there are a number of other categories of costs, taken from economics and accounting, which have relevance in describing, determining, and analyzing the direct costs of education. The first such grouping is total, average, and marginal costs. Total costs represent the sum of all direct costs involved for the program or programs being considered at a given level of operation. The average cost is expressed on a cost per unit basis; it is obtained by dividing the total cost by the number of units of education that are produced. The marginal cost is the incremental outlay required to obtain or serve one additional unit. The average cost and the marginal cost of a program are usually different. This difference arises from another type of cost distinction--fixed and variable costs. Fixed costs are those which are constant over a given range of program output or level of service (e.g., teacher's salary for a class where the class size may range from twenty to thirty students). Variable costs are those which vary directly with the level of activity or service (e.g., individual instructional materials for each pupil). Table 4.1 provides a brief example to illustrate these terms.

Another important cost concept, and one which causes significant difficulty in education, is that of joint costs. Joint costs are those costs for resources which are shared by two or more programs (e.g., an assistant superintendent supervising several different instructional programs in a district, or a school psychologist testing both handicapped and nonhandicapped students). In determining the costs of a particular educational program, the problem of how to deal with the shared resources and joint costs frequently occurs. The general procedure is to allocate the joint costs on a reasonable basis among the programs involved. The most common bases are: time; average daily membership or pupils enrolled; time space; time consumption; number of pupils; mileage; units consumed; number of transactions; employees; and dollars.[12] The choice of the base to use for allocation should be appropriate to the manner in which the resources are shared.

Questions of joint costs and other cost allocations raise serious difficulties for cost determination in special education. Issues of allocation of personnel, equipment, and facilities that serve handicapped children as well as

TABLE 4.1

ILLUSTRATION OF COST CATEGORIES

For an educational program of one classroom (one teacher, twenty-five students)

Quantity	Resource	Unit Price of Resource	Cost	Cost Type
1	Teacher	$15,000	$15,000	(FIXED COST)
1	Classroom Space	$ 3,000	$ 3,000	(FIXED COST)
25	Books & Supplies	$ 30	$ 750	(VARIABLE COST)
25	Desks	$ 100	$ 2,500	(VARIABLE COST)
		TOTAL COST =	$21,250	

AVERAGE COST = $\frac{\$\ 21{,}250}{25 \text{ students}}$ = $ 850/student

MARGINAL COST equals the sum of the variable unit costs = $ 130/student

If one student were added to the class (for a total of 26 students), then:

Total Cost = $ 21,250 + $ 130 = $ 21,380

Average Cost = $ 21,380/26 students = $ 822/student nonhandicapped children occur both among different special education programs and between special education and other educational programs. The potential for such difficulties will increase as trends toward mainstreaming and least restrictive environments for handicapped children continue.

The nature of the educational process itself--its structure, organization, and administration--poses certain underlying problems for cost determination. The first is the difficulty in specifying and measuring all of the relevant inputs or resources in an educational program. This stems from a lack of concensus on what education is. A restriction of the concept of education to schooling reduces the complexity, and this definition is certainly relevant to school district and state educational budgeting. However, it does exclude many other activities which contribute to students' learning and which have costs. Even this distinction becomes blurred in practice with such activities as field trips to museums, use of public libraries by students, provision of public services to schools at no charge, and parent tutoring. The input measurement may remain difficult even if agreement can be reached on which activities should be included; joint cost questions of which proportion of which resources to allocate to which programs can prove to be quite troublesome to resolve.

Education in the United States is provided by a schooling system which has multiple and separate organizational levels--school districts, intermediate educational units, state departments of education, U.S. Office of Education--which are not standard or uniform in their organization or operation. They are linked together by law, regulation, and tradition, but this linkage is somewhat loose. Each has independent revenue raising powers and budgets for which they are responsible. Information systems, reports, and cost data reflect the interests and concerns of the organizational level at which they are produced. District budgets, for example, will identify revenue from all sources (local taxes, state and federal funds) and the costs for the programs that the districts operate. State budgets, however, report only the state costs of education (the amount of state funds apportioned to school districts), as these are the costs that are of primary interest to the legislative and executive branches of state government. In addition, there are a number of other public and private agencies which provide education and may have different accounting and information systems; these include state residential schools for handicapped students, Departments of Health, Mental Health, and Institutions, hospital schools associated with colleges and universities, and private day and residential schools for various types of students. The problems of comparable reporting and available cost data are even more difficult when different and unrelated organizations are involved.

When cost data are available from a school district, at the state level, or from another agency, the format of the data is often inconvenient and difficult to use for cost analysis of separate programs. The reason is that the data come from cost accounting systems that were designed to fulfill legal and stewardship obligations related to the use of public funds, and the classification structures which were developed did not allow the accumulation of costs by separate programs. A common form of presentation of cost data is by object-of-expenditure (e.g., teacher's salaries, instructional materials). As an example of the analytical difficulties involved, the expenditure item instructional salaries may include salaries of all teachers--regular, special education, vocational education, etc.--as a single item. Without a review of individual personnel assignments and salaries, an inordinately time-consuming process at the district level and impossible at the state level with aggregated district data, it would not be feasible to determine the cost of special education instructional personnel from such cost accounting records. However, the 1973 revision of the U.S.O.E. handbook on financial accounting does make a provision for utilizing a type of classification by program in coding expenditures, as well as by the standard object-of-expenditure classification.[13]

These data difficulties, as related to cost determination in special education, were summarized in a recent survey of the availability of cost data in nine states by the National Center for Educational Statistics:

1. No state surveyed had all the data needed for a detailed analysis of the excess costs involved in education of the handicapped.

2. Few of the states maintained a detailed accounting system for their education of the handicapped programs.

3. None of the states surveyed maintained an information system at the requested level of detail on the resources used for education of the handicapped.

4. The cost data provided by each state were not comparable.

5. Few states provided cost data on institutionalized children under the care of other state agencies.

6. Some states supplied statistical data from administrative financial accounting systems tailored to reimbursement of local education agencies (LEAs) for the costs of educating handicapped children. If the state did not reimburse LEAs for particular extra services for the handicapped, the state administrative system did not provide these data.

7. In some states the program accounts for special education and general education utilized different cost categories, making excess cost inferences uncertain.

8. Many handicapped children were in instructional situations which make allocation of costs difficult.[14]

A final difficulty in cost determination in education arises from the fact that education is a dynamic process. Over time there can be significant changes as different instructional approaches are tried, new equipment is developed, different organizational configurations are implemented, and the services provided to students are varied. However, cost accounting systems report historical costs--

the costs of what the programs are, not what they will be. These historical costs are frequently the only available cost data. Such data can be useful in establishing current or recent past baseline cost information and for establishing the magnitude of the effort involved. However, in special education, where recent legislation and court rulings are requiring new approaches and patterns of serving handicapped children, past cost data can have limited validity as predictors of future costs. Further, past program practices, which are reflected in the past cost data, are not necessarily the appropriate or proper ones and may change significantly in the future. Therefore, when using past cost data to estimate the cost of future programs, care must be taken that the data are relevant to their use or appropriate adjustments made.

Nature of Costs of Educating Handicapped Children

It is widely recognized that it costs more to educate a handicapped child than a nonhandicapped child. Why might this be so? There are a variety of reasons for an increase in costs and these costs will vary with the individual handicapped child and the programs and services received.

Self-contained classes, a common special education program for some handicapped children, have much lower class sizes or student/teacher ratios than do regular classes, often half the number of students and sometimes as low as two or four students served by a single teacher.

Since the teacher's salary comprises the largest component of the instructional cost and the cost of a teacher in a classroom can be considered a fixed cost (not varying with the number of students served), the lowered number of children in a self-contained class greatly increases the per student cost for handicapped children in this program.

Some handicapped children receive special education services in addition to a regular education program; the total cost of their education would include both the cost of the regular education program and the cost of the additional special education services. Children enrolled in a speech therapy program for three hours per week would be an example. Also, many handicapped children require not one, but multiple special education programs and services; for example, more severely handicapped children in self-contained classes may also require speech therapy, physical therapy, and specialized vocational training for an education appropriate to their needs. Other handicapped students require specialized instructional materials and/or equipment to meet their educational needs; such materials and equipment are often expensive and they are used by relatively few students, resulting in a high per student cost. Additionally, some handicapped students require special transportation services, including specially modified vehicles which transport small numbers of students, again at a high cost per student.

Another crucial and additional process in special education is that of identifying handicapped children, assessing their educational needs, and planning educational programs for them. P. L. 94-142 requires that an individual educational program be developed for each handicapped student; this important step necessitates a professional diagnostic evaluation of a child and a conference of several staff members (and sometimes a parent as well) to decide upon an appropriate educational program for the child. This can be a time-consuming and expensive process not required for nonhandicapped students. Special education also needs additional support staff to provide assistance to the handicapped students, their parents, their teachers, and other students and personnel in the schools; examples of such persons are school psychologists, school social workers, parent trainers, and specialized counselors.

Often additional training is necessary for teachers who work with handicapped students; this can be both preservice preparation at a college or university (generally at the graduate level) and/or inservice or later training provided by the school district. In the first case, the district may be required to pay higher salaries to special education teachers, and in the second, the district may pay the costs of the additional training.

Finally special education may serve students of a greater age span than regular education. P. L. 94-142 mandates services for children ages three to twenty-one. Early childhood education is a rapidly growing field, particularly in special education.[15] Some very young handicapped children are receiving stimulation and training programs which allow them to develop basic skills and abilities approximating their nonhandicapped age peers (e.g., programs for deaf children as young as six months). Such attention and effort in early years can prevent or reduce the impact of handicapping conditions and allow these children to function in a more normal school environment. Without such programs children may remain in restricted and expensive special education programs throughout their school careers. These early education programs are costly--concentrating large numbers of resources on a relatively few children. However, they may be very cost-effective if the early intervention efforts of a few years duration reduce the need for and costs of special education for these children throughout most of their school years. On the other end of the age spectrum, some handicapped students need to stay in special education programs beyond the normal school leaving age in order to raise their academic, vocational, and self-help skills so that they may reach or approach more closely self-sufficiency. Again these programs may be expensive initially, but they may prove cost-effective if the students become self-supporting and even taxpaying citizens rather than requiring public assistance for their existence.[16]

Handicapped children have vastly different educational needs, even those with the same nominal handicapping condition.[17] The concepts of least restrictive environment and individual educational programs set forth in P. L. 94-142 are an effort to deal with handicapped children as individuals with unique needs. However, this diversity makes an assessment of the future more complicated. The variety of educational needs exhibited by handicapped children and the broader range of possible programs and services to be available in the future must be considered in any thorough analysis of future special education costs.

Types of Costs in Special Education

Many different schemes for categorizing the costs associated with special education are possible. For this reason, it is important to distinguish among the various types of costs and to establish a consistent and useful set of definitions for analyzing special education costs. One such scheme would be to categorize costs by object of expenditure--a line item budget with such categories as salaries, instructional materials, etc. While this approach does provide detail about the resources being purchased, it is generally not sufficient by itself as it fails to distinguish between the costs of special education and other programs. Levin sets forth a different scheme based on the objectives for special education programs: costs for diagnostic services to identify handicaps; costs for standard instructional objectives; costs for special educational needs of handicapped students; and costs for meeting learning-contingent requirements (e.g., transportation, medical attention, protheses).[18] While helpful conceptually, this approach is difficult to utilize since available data are not collected in this format; further, there are considerable joint cost allocation problems in which single resources (e.g., special education teacher) are used for multiple purposes (e.g., diagnosis, standard and special instructional objectives) in unknown and varying proportions.

Another primary means of categorizing costs, and the one that will be used in this study, is based on the scope of the special education program being considered. The three types of costs distinguished under this scheme are: 1) the special education program cost; 2) the excess cost of the special education program; and 3) the total cost of educating handicapped children. This approach was selected because it is generally consistent with available cost data, requires a minimum of accounting manipulation of the data, and focuses on programs and resources of special education.

Special education program cost

The first type--cost of the special education program--is simply all of the expenditures directly related to and identifiable with special education. For example, it would include salaries for special education teachers, specialized materials and equipment, and support services specifically provided for handicapped students. It would not usually include any general school or district costs which would have to be allocated to special education. To obtain the cost of the special education program, all of the expenditures for resources and activities directly associated with the program are summed, often from the available district accounting records.

Excess cost

Another important cost concept which has evolved in special education is that of excess cost, or the additional costs of educating handicapped students over and above those of educating nonhandicapped students. This concept, in various formulations, has received a great deal of recent attention in special education and has been utilized by P. L. 94-142, various state statutes, and many of the previous cost studies in this field.[19] It is based on an equity concept that handicapped children are entitled to at least as much money spent on their education as nonhandicapped children, plus an additional or excess amount due to extra educational needs caused by their handicapping condition. The focus then becomes determining which programs and services and, consequently, which costs are excess for handicapped children and which are not. This is not necessarily a simple task due to the multiplicity of programs and services offered to handicapped children in a variety of organizational arrangements.

In establishing which programs, services, and costs are to be considered excess, it is useful to divide the programs and services into three groups, based on their relationship to the regular school program: 1) supplement to the regular program; 2) replacement for the regular program provided within the regular school building; and 3) replacement for the regular program provided outside the regular school building.[20] The general listing of special education programs provided in Chapter II can be grouped according to these divisions as follows:

1. Supplement

   Regular class with assistance

2. Replacement within school building

   Separate class within regular school

3. Replacement outside school building

   Separate day school
   Residential school
   Other educational environment

For each division the excess costs are determined in a different manner. The students who receive supplemental programs and services are usually mildly handicapped and obtain the bulk of their education from the regular education program. The supplemental special education programs and services can be considered completely excess since the students receive them in addition to the regular education program. Therefore, the costs to these programs can also be considered totally excess.

The calculation of excess costs for the replacement groupings is more complicated. The general procedure is to total the direct costs of the replacement special education programs, but then to deduct the costs of the regular education programs and services which are replaced. This net cost is then the excess cost. However, the replaced programs and services will differ between the two types of replacement programs. Those handicapped students served in replacement programs within the school still receive the services of the school plant, the school administration, and the district office. What is replaced is the instructional component in the school. Therefore, to calculate the excess cost for this type of program, the deduction is for the cost of direct instruction in the regular program. For replacement programs outside the school the cost of the replaced components of the regular program which are deducted from the special education program costs include the direct instruction, school services, and, depending on the specific program, part or all of the districtwide services.[21] Table 4.2 provides an illustration of these calculations on an average cost per student basis.

However, deduction of the average per student replacement costs can be a misleading calculation. Many of the costs on a classroom level are fixed over the range of a few students per class and the reduction of several students would not appreciably change the costs of that regular classroom. Similarly, schoolwide and districtwide

TABLE 4.2

EXAMPLE EXCESS COST CALCULATIONS

Regular Education Program	Average Cost Per Student
Regular instruction	$ 700
Other school services	300
Districtwide services	200
Nonhandicapped Total Cost	$1,200
Supplemental Programs	
Resource room instruction	$ 500
Deduct:	0
Excess Cost	$ 500
Replacement Within School Building	
Special class instruction	$1,600
Deduct: Regular instruction	(700)
Excess Cost	$ 900
Replacement Outside School Building	
Residential school instruction	$3,000
Deduct: Regular instruction	(700)
Other school services	(300)
Districtwide services	(200)
Excess Cost	$1,800

service costs are not greatly affected by the reduction of a relatively small number of students. Rather than deducting the average costs per student of these components (which are relatively easy to calculate from student and financial records), the marginal costs per student would be the correct deduction. Unfortunately, marginal costs per student are generally unknown since they are not collected or reported by educational financial accounting systems. They will, however, certainly be much smaller than the average costs per student.

Total cost of educating handicapped children

The third type of special education cost refers to the costs of the total collection of resources provided for handicapped students. It includes both the specifically identifiable special education costs, the costs of the regular education program which handicapped students receive, and also any joint costs in the district which are allocated to special education on a pro rata basis. To calculate the total costs of educating handicapped children it is necessary to add a proportional share of the costs of those services provided to all students (e.g., district administration, debt service) to those of the special education program.[22] Table 4.3 provides an example illustrating all three types of costs with the different types of special education programs.

When special education costs are separately identi-

TABLE 4.3

THREE TYPES OF SPECIAL EDUCATION COSTS
(costs in average dollars per student)

	Regular Program Cost	Special Education Program Cost	Excess Cost	Total Cost of Educating Handicapped
Supplemental Programs	$	$ 500	$ 500	$ 500
Direct instruction	$ 700			700
Other school services	300			300
Districtwide services	200			200
Total	$1,200	$ 500	$ 500	$1,700
Replacement Within School		1,600	1,600	1,600
Direct instruction	700		(700)	
Other school services	300			300
Districtwide services	200			200
Total	$1,200	$1,600	$ 900	$2,100
Replacement outside School		3,000	3,000	3,000
Direct instruction	700		(700)	
Other school services	300		(300)	
Districtwide services	200		(200)	
Total	$1,200	$3,000	$1,800	$3,000

Note: In each case, the regular program cost plus the excess cost equals the total cost of educating a handicapped student.

fied, educational financial accounting systems generally collect and report expenditures on a special education program cost basis.[23] Neither the deductions for replaced services to calculate excess costs nor the additions for regular education services also received to calculate the total costs of educating handicapped children are usually part of the accounting system. If done at all, these calculations are separate, analytical operations. However, the type of cost (program, excess, or total) utilized for determining or estimating the costs of special education will have a significant impact on the magnitude of the reported costs for special education.

The dollar impact of the different types of costs is illustrated in Table 4.4 for a hypothetical school district haveing 500 handicapped students divided among the various special education programs in a typical fashion. Using the special education program cost figure as a base, the excess costs show a decrease of about one third, due mostly to the deduction of average replacement costs for within school programs. If, however, the marginal cost per student had been known and used instead of the average cost per student, the deduction would have been smaller and the excess cost much closer to the special education program cost. The total cost of educating handicapped children, however, is double the special education program cost; the primary reason for this increase is the inclusion of the regular education costs for those students in supplemental programs.

TABLE 4.4

IMPACT OF DIFFERENT TYPES OF SPECIAL EDUCATION COSTS

	Type of Program			Total
	Supplemental	Replacement w/in School	Replacement Outside	
Number of Handicapped Students	325	150	25	500
Special Education Program Cost				
Avg. Cost Per Student	$ 500	$ 1,600	$ 3,000	$ 955
Reported District Cost	$162,500	$240,000	$75,000	$477,500
Excess Cost				
Avg. Cost Per Student	$ 500	$ 900	$ 1,800	$ 685
Reported District Cost	$162,500	$135,000	$45,000	$342,500
Total Cost of Handicapped				
Avg. Cost Per Student	$ 1,700	$ 2,100	$ 3,000	$ 1,945
Reported District Cost	$552,500	$315,000	$75,000	$942,500

Even though the students involved in the supplemental programs are classified as handicapped, they receive a relatively small proportion of their total educational program via special education. As a result, the regular education cost components for these students are typically included as part of the costs reported for the regular education program, since they represent regular education activities devoted to regular education instructional and administrative objectives.

In any event, when using the special education program cost definition, the cost elements included in and the limitations of this cost type should be recognized: the costs of regular education for students receiving supplemental programs (which are often a majority of students in special education) are not included; and the costs of replaced services for students in other special education programs have not been deducted. In spite of these restrictions, the use of the special education program cost does provide the most complete picture of the expenditures specifically for special education.

Previous Cost Studies in Special Education

There have been relatively few efforts to determine the costs of special education on a comprehensive basis, and even fewer which have projected future costs for expansion of special education programs and services to all handicapped children.[24] Widespread interest in

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special education has only occurred recently. Previously, it has attracted little attention from policy makers, cost analysts, and educational finance researchers due to the relatively low dollar amounts involved. Historically, special education has been somewhat isolated from regular education and the issues for research have been strongly influenced by educators within the special education ranks who have been more concerned with programmatic developments than administration or cost analysis. Funding requests have tended to rely more on emotional appeals than on cost analyses. Finally, in those cost studies which have been done, a single methodology has predominated. This appears to have reduced the interest in other approaches due to a desire for comparability among subsequent studies.

Available cost studies in special education can be classified along two dimensions, each further subdivided into several categories. These are shown below.

Type of Program

1. Actual or average programs
2. Exemplary programs
3. Theoretical programs

Type of Cost Determination Methodology

1. Cost per student
2. Cost index
3. Supplemental, replacement, and common costs

4. Resource-cost model

This classification scheme is presented to highlight the distinctive features of the available studies, and the categories within each dimension are not necessarily mutually exclusive. As a result, a single study may have features of several different categories. The classification scheme was derived from a review of the primary objectives, focus, and results of the cost studies.

Type of program

The first dimension of the classification of cost studies is that of the type of program from which costs are developed. Rossmiller identifies two types: empirical studies using actual district or state data; and theoretical studies relying on the judgement of authorities and experts to determine the handicapped population, special education programs and services, and the cost elements which would comprise the ideal system.[25] The empirical studies can be further differentiated between those which are concerned with presenting data for exemplary or best-practice programs or school districts and those studies using data from non-exemplary or average programs or those available to the researchers.

Empirical cost studies by their nature are studies of historical costs and are subject to the limitations previously discussed. Past program practices may have been inadequate or be significantly changed in the near future. Further, they reflect past expenditure patterns with no necessary relationship to program quality or efficiency or to current and future educational needs.

Theoretical studies offer more flexibility than empirical ones. With no fixed (historical) data base, it is much easier in the cost analysis to incorporate future expectations and assumptions which may differ from past or current practice. However, as noted by a recent review of special education cost studies, the theoretical approach has its own difficulties:

> . . . the expert opinion method lacks the objectivity of an empirical approach. The choice of experts will be a major determinant of the results obtained. Furthermore, the results are only as good as the assumptions used to generate them. If historical input data are used by the experts the results will be subject to the same limitations identified in the [empirical] cost studies.[26]

Type of cost determination methodology

Four different types of cost determination methodologies in special education are identifiable. They are: cost per student; cost index; supplemental, replacement, and common costs; and resource-cost modeling.

Cost per student. The cost per student approach calculates the average cost for each student in a special education program. The type of cost may be a program cost, an excess cost, or a total cost depending upon the study. Further, the overall special education program is often subdivided and costs calculated for the subprograms (e.g., average cost by type of handicapping condition). This methodology sums the costs of a special education program (or programs) and divides by the number of students in the program. The result is the average cost per student.

There have been several studies providing cost per student data for special education. In 1973, the Rand Corporation prepared a comprehensive national report on the status of services to handicapped youth which were available from educational, health, welfare, vocational rehabilitation, and mental health agencies.[27] Aggregate state and federal cost data were presented for the year 1972-73 along with the numbers of handicapped children by type of handicapping condition receiving services, and an average cost per student for each handicapping condition was calculated. Many caveats concerning the validity and accuracy of the source data were given. In spite of its acknowledged limitations, the study provides a baseline of summary state and federal expenditure data for special education for a relatively recent year.

Similar data problems were encountered in a study of the costs of special education in Oregon school districts.[28] The major problem cited was the unreliability of the available pupil and cost data. Costs per type of handicapped student were calculated from data obtained from school district records. The cost data, however, were for only those cost elements reimbursable by the state. Thus, the study provided an estimate of the state portion of special education costs, not the full costs of providing such programs, and has limited utility outside of Oregon.

An important limitation of the cost per student results is that they are time and place bound; that is, they reflect the prevailing teacher salaries and price levels of other resources for a given time period in the jurisdiction in which the study was done. The validity of generalizing from such results to other jurisdictions and comparing program costs across jurisdictions may be severely limited by the price levels inherent in the original data.

Cost index. To eliminate the time and place bound difficulties of the cost per student approach, many studies have employed a cost index methodology. This procedure allows a relative comparison between the average cost per student of special education programs and of regular education. Since the result is expressed as a ratio, it is neither time nor place bound. Instead it shows the relationship between the costs of the special education programs and the regular education programs, which can be compared across different jurisdictions. This approach to cost determination in special education, first utilized by the National Education Finance Project (NEFP) in 1968-69, has become the dominant methodology in special education cost studies.[29]

The general procedures in the cost index approach are as follows:[30] First, the full-time equivalent enrollments in each educational program in the school district are obtained from district records (e.g., regular education, mentally retarded, visually handicapped, speech impaired, etc.). Next, the total current expenditures for each of these educational programs are determined from existing accounting records. All joint or common data are allocated among the various programs on reasonable bases. Then, the total cost of each program is divided by the number of full-time equivalent students in the program to arrive at a total cost per student for each program. The "cost differential," which is the difference between the cost per student of a special education program and the regular education or base program, is calculated for each special education program. Finally, a "cost index," which is the ratio of the cost per student of a special education program to the cost per student of the regular education program, is calculated for each special education program. A ratio greater than one indicates the degree to which the estimated total cost of a special education program is greater than that of the regular education program. Table 4.5 provides an illustration of this procedure for several special education programs.

The cost index approach is not without problems, however. Several of the limitations are noted by Rossmiller, the most well known researcher using this approach.

> A cost index generally is expressed as either a statewide average or a median . . . . Provision must be made . . . to deal adequately with the

TABLE 4.5

SAMPLE COST INDEX CALCULATION

District Programs	Students	Total Program Cost	Cost per Student	Cost Differential	Cost Index
Regular Education	5,000	$6,000,000	$1,200	--	1.00
Mentally Retarded	100	$ 228,000	$2,280	$1,080	1.90
Speech	150	$ 207,000	$1,380	$ 180	1.15

> fiscal needs of individual districts which deviate from the state average for good and sufficient reasons . . . . They reflect only what is currently being done, not what could be done (or should be done) in the way of educational programming for specific pupils . . . . Cost indices show the relative cost of educating pupils in special programs compared with the cost of educating pupils in regular programs . . . . It is possible that a given special education program could be offered to an equal number of students, could provide the same educational services, and could cost the same amount per pupil in two school districts but the cost indexes in the two districts could differ because of differences in the cost of the regular program in each district . . . . A cost index which lumps together all programs for educating a particular category of handicapped children without regard to the way in which educational services are delivered to such children will mask a great deal of cost variation within these programs . . . . Finally, . . . for a variety of reasons, costs will vary between districts for identical programs, . . . the cost of transporting pupils involved in special programs, . . . pupil/teacher ratio, . . . differences in salaries and in the cost of educational supplies and materials, . . . and these differences will be reflected in educational program cost and in cost indices.[31]

The NEFP study by Rossmiller, et al. in 1968-69, which pioneered the use of a cost index, is the most widely known and replicated cost study in special education.[32] The study collected and analyzed cost data in twenty-four school districts in five states which offered comprehensive, high quality (as judged by a panel of experts) special education programs to various categories of handicapped students. The overall cost index averaged about 2.0 for all special education students, but there were wide variations among categories within a single district and among districts with similar categories. Rossmiller is his own best critic, as all of the limitations quoted above apply to this study: lack of adequate measures of level and types of programs; variations in costs of regular education programs affecting the indices; aggregation of costs by handicapping condition rather than method of service delivery; and unique district characteristics. One additional caution is also in order. The cost data came from district accounting records and underwent substantial manipulation during the analyses. Of particular concern is the allocation of various overhead costs (e.g., administration, operation and maintenance) which represented important proportions of total special education program costs; such allocations could have distorted the derived per student costs and cost indices.

The greatest limitation of this study and approach to future cost estimation is the lack of specific program data. The costs were collected by type of handicapping condition without regard to the actual special education programs being provided to students. For a given category in a district, the costs of all instructional programs were lumped together (e.g., consultive services, resource rooms, part and full-time special classes) to arrive at the cost index for the category. Since districts had different programming practices for students with the same nominal handicap label and the average cost per student in various special education programs varied greatly, the variations in practices among districts could have been as important a cause for cost variations as differences among handicapping conditions. Without knowledge of the specific program practices that were in use in the exemplary districts, there is no means of incorporating programmatic changes in special education since 1968-69 into future cost estimates and such estimates are limited to extrapolation of historical costs based on unknown program practices. Thus, while the results of this study provide information concerning the average and range of costs for categories of handicapped students in several selected exemplary special education programs, the limitations in the cost index methodology restrict the generalized use of the findings for program and fiscal planning, both in other jurisdictions and in the future.

Subsequent to the original NEFP study, there have been many individual state studies conducted using the cost index methodology; these have included studies in Delaware, Florida, Idaho, Illinois, Indiana, Kentucky, Mississippi, South Dakota, and Texas.[33] In contrast to the exemplary programs utilized by the NEFP study, these state studies generally used data from a sample of school districts which included average and below average special education programs as well. As these state studies followed the specific cost index methodology developed by the NEFP study, they generally found the same results--an overall median index of approximately 2.0 with much variation among districts and among categories. These studies are also subject to the same limitations of the original study. One disturbing aspect of the similarity of the results of several of the state studies is that some of the consistency was researcher imposed; when the actual state data differed significantly from the NEFP results, the state results were invalidated and replaced by the NEFP results.[34]

Additional cost studies of special education were generated by the impetus of the original NEFP approach. Bentley[35] utilized the NEFP data base to compare the significant cost components of regular and special education for sixteen school districts. It was found that six of the eight cost components investigated (administration, fringe benefits, instructional supplies and equipment, operation and maintenance, support services, teachers, teacher aides, and transportation) did contribute significantly to the cost difference between regular and special education. However, there were great variations in the importance of each component to the cost differences among the various districts and categories. The study concluded that the extremes found in the expenditure levels for special education categories prohibited valid comparisons among districts. This result illustrates the difficulty encountered in this approach by considering only the dollar comparisons and not analyzing the programmatic differences among the districts.

Two studies of Indiana school districts have been conducted using the NEFP methodology. The first, by Jones and Wilkerson[36] in 1972, developed cost indices for special education categories for two districts to compare their costs with the NEFP results. It was found that the cost indices for these two districts were similar to those developed by the NEFP study. However, the authors noted that differences in program approaches and costs between their sample districts caused great variations in the derived category cost indices. A year later, Snell[37] conducted a similar study of three other Indiana school districts. The results were generally close to those of the NEFP study and of the Jones and Wilkerson study; however, the overall median index for all special education categories was 1.4, lower than the 2.0 of the NEFP results. Snell cited two serious limitations to his study: the small number of districts surveyed; and the arbitrary cost allocation procedures used to arrive at total costs of the categories.

Sorenson[38] developed cost indices for special education programs (i.e., handicapping categories) in seven Illinois school districts chosen for their geographic diversity and program comprehensiveness. The costs were divided into three types--direct instruction, support services, and general administration--and then summed to arrive at a total cost for each type of handicap. Like other studies of this type, Sorenson found that the cost indices varied greatly within individual districts and among similar categories in different districts and that data gathering proved difficult due to the lack of special education information in accounting records.

McClure[39] conducted an analysis of the total special education costs by handicapping category in twenty-three school districts in Illinois. The study calculated the average per student cost, the cost differential between special and regular education, and the cost index for each of several special education categories. The unique aspect of this study was the grouping of categories by "resource intensity" (i.e., the pupil/teacher ratio for the category). Not surprisingly, since personnel costs comprise the bulk of total educational costs, those categories with the lowest pupil/teacher ratios had the highest cost indices.

In 1974, Clemmons[40] carried out a cost analysis of exemplary special education programs of six selected Minnesota school districts. Using an NEFP-type methodology, cost indices were calculated for each of seven different types of handicap. However, this study also extended this approach by calculating program costs by type of delivery system as well; six program alternatives were utilized--regular classroom with consultant, regular classroom with itinerant teacher, regular classroom with resource room, part-time special education classroom, self-contained special education classroom, and homebound or hospitalized instruction. Although the small sample size limited the ability to generalize the results, the use of the mode of service delivery as a basis for cost analysis reduced the difficulties caused by combining the costs of all handicapped children of a single category into a single cost regardless of the type of service received.

Supplemental, replacement, and common costs. A third cost determination methodology focuses on identifying the supplemental, replacement, and common costs for an overall special education program. Both cost per student and cost indices have been used in studies of this type, but the analytical emphasis in this approach is on specifying which functions and costs are appropriately in each cost category and making the subsequent adjustments to the regular and special education program costs to reflect these changes.

A recent empirical study of the costs of special education in New York City schools exemplified this approach.[41] First, the special education enrollments by type of handicap were categorized according to two factors: 1) the organizational arrangement of the special education program--full-time self-contained classrooms vs. regular instructional program with part-time special education services in resource rooms or from itinerant teachers; and 2) the severity of the handicapping condition. The total costs of educating handicapped students were separted into two components: the costs of services provided specifically to handicapped students (program costs) and costs of common services provided to all students (proration of joint costs). Per student costs for each of the thirty-five special education programs in New York City were calculated by adding the special education program costs (e.g., instruction, support, management, and special transportation) and the common costs (e.g., district administration and support). In the case of students in programs located outside public school buildings (e.g., home instruction, hospitals) the allocated common costs were reduced by the average amount spent per student districtwide for services they did not receive (e.g., school security, school lunch, facilities planning and maintenance). Additionally, cost indices were calculated for each of the special education programs. These indices were then compared with those of similar categories from the NEFP study. Of the nine programs compared, five were approximately of equal cost. The remaining four, primarily those for the more severely handicapped, were more expensive in New York City. The reasons for the greater costs in New York City were reviewed.

A brief paper by Taylor[42] utilized a theoretical, judgemental approach to estimate the costs to a school district of serving all handicapped children in appropriate programs. The programs offered were of three types: supplemental to regular education; substitutes for regular education within the regular school building; and substitutes for regular education outside of the regular school building. For each program type the total costs of educating handicapped students were calculated, including adjustments for joint costs and common services not received. Finally, both a per student cost and a cost index were calculated.

Resource-cost model. The resource-cost model methodology uses an entirely different approach from those preceeding. The focus of this approach is on the internal construction of the total special education program--definition of programs in terms of resources, allocation of handicapped children to various programs, student/teacher ratios, etc. Consequently, the program costs are explicitly derived from the structure of the special education program.

Rather than beginning with costs taken from an accounting system, the analysis begins at the student or school level and, in essence, builds the program from the bottom up. First, a set of special education programs and services is established and the handicapped children served or to be served are allocated among them according to present practice and/or anticipated need. For each program, the resources required to provide it are specified along with their prices. These are summed to arrive at a unit cost for each program. The total cost for the program is then calculated via the unit price and the quantity required for each program. The quantity for each program is derived from the number of children assigned to or anticipated for each program. Finally, the total special education cost is obtained by summing the individual program costs.

This approach assumes that there are no scalar economies involved in special education--that there are no fixed cost components which could be spread over an increasing number of units to reduce the cost per unit as the volume of units increases. For direct instructional costs using a teacher unit as the program unit of analysis and estimating costs on a district or larger basis, this assumption is reasonably accurate. However, for district-wide costs, such as identification and assessment activities, special education administration, and certain support services, this would not be the case. These are more typically costs which, within a broad range of the number of students involved, are largely fixed. For example, there may only be one supervisor of special education for a district of up to 10,000 students; an additional administrator might be added for every additional 10,000 students. The cost analysis must change bases (from the teacher unit to the district) to take these different types of cost items into account.

Few cost studies of this type have been done due to the dominance of the cost index methodology and to the problems of obtaining necessary data from school accounting systems. There are no inherent restrictions on the type of data which may be used in this approach; most efforts using a resource-cost model methodology have relied on some combination of theoretical, exemplary, and average data and have aimed primarily at the projection of future costs.

The accounting firm of Ernst and Ernst applied an industrial cost accounting system to the collection and reporting of special education costs in Illinois.[43] The approach, developed hypothetically but not implemented, required specifying an explicit and detailed pattern of resource use defined in ten minute segments of instructional time. A unit was derived for each distinct type of ten minute segment by designating and costing out the resources involved. The total program cost was obtained by summing the costs of the various ten minute segments that were required in a specified educational program. This represented the school's or district's projected costs or budget. Actual costs were to be collected in the same segments and a variance analysis was to be conducted to discover the reasons for differences between planned and actual operation. As an accounting system, this model focused on historical costs; it was not intended to relate costs to needs. The actual operation of the system appears to be an enormously complex and detailed bookkeeping task which would make it unmanageable, extremely expensive to use, and generally inappropriate for education.

Special education cost projections

In addition to the determination of the costs of past or current special education programs, several studies have also developed projections of future special education costs. Three primary approaches have been used for these projections: extrapolation of past costs; replication of exemplary programs; and combination of expected program and cost factors into a resource-cost model.

Extrapolation of past costs. This approach is the simplest and perhaps the most frequently utilized approach to estimating future costs in education. The latest reported cost data, generally from the prior year, are taken as the best predictors of future program costs. The extrapolation calculations are usually based on a cost per student or cost index established for these past programs, and extended to apply to some anticipated future population of handicapped students to be served.

This historical orientation assumes that the past patterns of students, services, and instructional approaches (i.e., the educational process) will remain constant in the future. In a period of rapid change the flaws in this critical assumption are serious; they may result in the cost data being out of date before they are reported. This approach also limits the future to what has happened in the past since no other data are available. However, it is possible to adjust the past cost data for known, planned, or expected changes in the future, such as increasing teacher salaries to reflect a new contract, or using an inflation factor to modify prior year prices. Finally, this procedure assumes that the current average cost is equal to the marginal cost of expanding special education programs. This assumption may also be in serious error if the students to be served in the future and the programs that they will receive differ significantly from the current situation. While historical costs may be relevant in some instances, these data should be treated with caution when used to estimate future costs.

The Rand study discussed above also projects future costs of special education.[44] The 1972-73 average costs per type of handicapped student together with assumed incidence rates of children with handicapping conditions were used to project the costs of serving all of the children estimated to need special education. The total costs were estimated to be approximately $5.2 billion in 1972-73 dollars. This estimate is only a very rough approximation and its qualifications and limitations were specified in the study. Primary among these were the quality of the input cost data, the assumptions of incidence rates, and the use of current average costs as marginal costs for unserved children.

Replication of exemplary programs. This approach focuses on those programs thought to be outstanding and uses them for a standard by which to estimate what future costs could be or should be. The procedure is as follows: 1) identify certain programs as representing the "best practice" currently available; 2) determine the costs of these programs, usually through existing cost records; 3) project the costs of extending these exemplary programs to all students. This approach assumes that the exemplary programs are generally applicable to all students and to all locations and that they will replace all similar programs. The scope of the programs involved may be from a total educational system to a specialized program or set of services for a specific group of students. Generally, the projection methodology utilizes either a cost per student or a cost index approach to project the costs of the exemplary programs.

The selection of the exemplary programs is a crucial element in this approach. A lack of standardized and agreed upon output or effectiveness measures for educational programs frequently forces this approach to rely upon the reputation of the program and the judgement of experts to choose the best-practice programs--a procedure in which public relations can play as great a role as program content.

Past costs are utilized as the basis for cost projections; however, since it is assumed that the existing programs will be moving toward replicating the exemplary programs, the costs of the exemplary programs, with inflation adjustments, are thought to be valid predictors of the future costs of all programs. This approach also implicitly assumes that all exemplary programs of a similar nature have a similar cost structure. (This was not found to be true in the NEFP study; there were wide differences in the cost indices of supposedly similar categories.) Otherwise, the resultant costs of the exemplary programs would represent a statistical average cost of high and low cost programs; this would result in a composite target cost rather than a uniform standard toward which all other programs are expected to progress. Unless the other existing programs adopted the exemplary practices in similar proportions to the programs which made up the exemplary program sample, the actual costs of replication would be different from the composite exemplary costs.

The NEFP study concluded with cost projections for serving the total estimated population of handicapped children in 1980.[45] For each handicapping category, an assumed incidence rate was established based on previous estimates of this type. These incidence rates were applied against two different U.S. Census Bureau population series projections for various age groups to obtain estimates of total numbers of handicapped children needing special education. The cost indices for each handicapping category and the national average cost per student were then combined with the handicapped population estimates to arrive at cost projections for serving all handicapped children. Separate projections were done for each different population series and for 1968-69 price levels and two different inflation rates. The total costs which were projected under these various assumptions ranged from approximately $6.0 billion (lowest population series and 1968-69 price levels) to approximately $10.6 billion (highest population series and highest inflation rate) in 1980.

Combination of program and cost factors. The third projection approach is the resource-cost model methodology applied to the estimation of future costs. Typically, this approach is coupled with a mixed data base, utilizing theoretical assumptions, best-practice procedures, and actual district or statewide average data. The various elements of a special education program--type and number of students served, programs and services provided, duration and intensity of various educational needs--are specified either theoretically or empirically, and their values estimated for a future time period. The program elements are used in a resource-cost model of the special education process to project future program costs.

Two states, Hawaii[46] and Arkansas,[47] have used this approach to project the total costs of special education. The projections were based on programmatic assumptions involving new directions for special education in these states. The input data used in the projections were a combination of actual data (e.g., current number of students served, average teacher salary), exemplary program aspects (e.g., programs and services to be offered, ideal pupil/teacher ratios in various programs), and theoretical assumptions (e.g., incidence rates, student placement patterns in educational programs).

In the previously described Taylor study, a simple cost model was used which replicated a total special education program in a school district. Relationships were established among students with various handicapping conditions, programs which they required, resource configurations, educational settings, and prices of resources. Expert opinion was used to select input values for the model. The model was then used to calculate the theoretical excess costs of different types of program delivery alternatives for different types of handicapped students if the district were to serve all handicapped students in the most appropriate manner.

A review of past efforts at special education cost estimation has revealed, first, that there have been few efforts to project the costs of educating handicapped children on a comprehensive, national basis, and, second, that all such studies had serious limitations. Seven main shortcomings predominated in these studies: past program practices formed the basis for future cost estimates; the methodologies did not allow for the inclusion of future programmatic expectations and assumptions which were significantly different from the past situation; the methodologies obscured the programmatic relationships which made it impossible to correct for future changes; use of aggregated per student cost figures may have hidden large cost variations; average, rather than marginal, costs were used to project the costs of serving additional students; manipulation of cost records and arbitrary cost allocations may have distorted critical input data used in the projections; and the studies were, for the most part, localized and the results were not able to be generalized due to the unique nature of the jurisdiction studied.

As a result, reliable cost projections for special education on a national basis are not presently available. In particular, there is a need to incorporate the changing future of special education into any cost projections, as contrasted with the historical orientation of most available studies.

Notes for Chapter IV

1. James S. Kakalik et al., Services for Handicapped Youth: A Program Overview, Report R-1220-HEW (Santa Monica, CA: Rand Corp., 1973), pp. 90, 111. To make the federal cost data comparable with state and local expenditures, costs for supporting development of instructional personnel and for research have been excluded.

2. State and local expenditures were based on data reported in National Association of State Directors of Special Education, State Profiles in Special Education (Washington, D.C.: National Association of State Directors of Special Education, 1977). State expenditures used were those reported for 1976. Local expenditures were estimated based on the weighted average of the local/state expenditure percentage split for those states reporting these data.

Federal cost data were obtained from U.S. Congress House, Subcommittee of the Committee on Appropriations, Hearings, Part 5, Department of Health, Education, and Welfare: Education, 94th Cong., 2nd. sess., 1976, pp. 180, 182, 185, 385; and The Budget of the United States Government: Fiscal Year 1978, Appendix (Washington, D.C:. U.S. Government Printing Office, 1977), pp. 334-36, 363-66. To have the 1976 federal cost data comparable with those reported for 1972 in the Rand study (note 1), similar adjustments and allocations were made to the reported 1976 budget data.

3. William H. Wilken and David O. Porter, State Aid for Special Education: Who Benefits? (Washington, D.C.: The National Foundation for the Improvement of Education, 1976), p. I-3 and Table I-8.

4. Kakalik, et al., Services for Handicapped Youth, p. 90. For a description of these programs, see National School Public Relations Association, Educating Children with Special Needs, (Arlington, VA: National School Public Relations Association, 1974), pp. 18-21.

5. Insight: The Council for Exceptional Children Government Report, December 1975, p. 3.

6. Ibid.

7. G. Fisher, Cost Considerations in Systems Analysis, RM-49 (Santa Monica, CA: Rand Corp., 1970), chap. 3.

8. For a more detailed discussion of these cost concepts, see Elchanan Cohn, The Economics of Education (Cambridge, MA: Ballinger, 1975), chap. 4; and J. Alan Thomas,

The Productive School: A Systems Analysis Approach to Educational Administration (New York: John Wiley, 1971), chap. 3; and Henry Levin, "Cost Effectiveness Analysis in Evaluation Research," in *Handbook of Evaluation Research*, eds. Marcia Guttentag and E. Struening (Beverly Hills, CA: Sage Publishing Co., 1975), pp. 98-100.

9. A standardized chart of accounts to record educational expenditures is provided by National Center for Educational Statistics, *Financial Accounting: Classifications and Standard Terminology for Local and State School Systems*, State Educational Records and Reports Series: Handbook II, Revised (Washington: Government Printing Office, 1973).

10. Theodore Schultz, *The Economic Value of Education* (New York: Columbia University Press, 1963), p. 29.

11. For a discussion of the indirect costs of education see Elchanan Cohn, *The Economics of Education*, chap. 4.

12. National Center for Educational Statistics, *Financial Accounting*, p. 82.

13. Ibid., pp. 70-77.

14. A Metz, N. Ford, and L. Silverman, *Study of Excess Costs of Educating Handicapped Pupils*, National Center for Educational Statistics, Report 75-223, DHEW (Washington: Government Printing Office, 1975), pp. 1-4.

15. For a review of early childhood education in special education, see Alice H. Hayden, "Perspectives in Early Childhood Education in Special Education," in *Behavior of Exceptional Children: An Introduction to Special Education*, ed. Norris G. Haring (Columbus, Ohio: Charles E. Merril Publishing, 1974), chap. 2.

16. For a brief discussion of the cost-effectiveness and benefits of special education programs, see articles by Edwin W. Martin and James J. Gallagher in *The Education of Handicapped Children*, eds. Gene Hensley and Nancy Cain (Denver: The Education Commission of the States, Report No. 23, 1972), pp. 3-4, 13-14.

17. For a summary of the conflicting and competing needs claims of handicapped children expressed in recent litigation, see David L. Kirp, "Law, Politics, and Equal Educational Opportunity: The Limits of Judicial Involvement," *Harvard Education Review* 47 (May 1977): 131.

18. Henry M. Levin, "Some Economic Considerations in Educating Handicapped Children," in *Futures of Education*

for Exceptional Students: Emerging Structures, ed. Maynard C. Reynolds (Reston, VA: Council for Exceptional Children, 1978), p. 160.

19. See U.S. Department of Health, Education, and Welfare, "Education of Handicapped Children," *Federal Register* 42, No. 163, 23 August 1977, pp. 42484-85; *Arkansas*, Act 102 of 1973, "The Handicapped Children's Act of 1973," Sec. 8; and C. Bernstein, et al., *Financing Educational Services for the Handicapped: An Analysis of Current Research and Practices* (Reston, VA: The Council for Exceptional Children, 1976), pp. 7-13.

20. For an application of these groupings to a school district's programs to calculate excess cost, see Graeme M. Taylor, "The Special Costs of Special Education," unpublished report of the 1973 Airlie House Conference sponsored by the Council for Exceptional Children, Warrenton, VA: February 28-March 1, 1973.

21. For an example of an excess cost calculation on a districtwide basis, see U.S. Department of Health, Education, and Welfare, "Education of Handicapped Children," pp. 42484-85.

22. Leigh S. Marriner, "The Cost of Educating Handicapped Pupils in New York City," *Journal of Education Finance* 3(Summer, 1977): 82-97, is a recent cost study utilizing this approach.

23. National Center for Educational Statistics, *Financial Accounting*, pp. 22-80.

24. For the most complete review of studies related to special education finance and cost, see Bernstein, et al., *Financing Educational Services*.

25. Richard A. Rossmiller, "Financing Educational Programs for Handicapped Children," in *Financing Educational Programs for Handicapped Children*, ed. Nancy Cain (Denver: Education Commission of the States, Report No. 50, 1974), p. 14.

26. Bernstein, et al., *Financing Educational Sources*, p. 12.

27. Kalalik, et al., *Services for Handicapped Youth*.

28. Arthur Young and Co., *Final Report on a Study of the Students and Programs Supported by General Fund Grants to School Districts for the Special Education of Handicapped Children* (Portland, Oregon: Arthur Young and Co., 1976).

29. Richard A. Rossmiller, James A. Hale, and Lloyd E. Frohreich, *Educational Programs for Exceptional Children: Resource Configurations and Costs*, National Education Finance Project, Special Study No. 2 (Madison, WI: Department of Educational Administration, University of Wisconsin, 1970).

30. Ibid., pp. 35-54.

31. Rossmiller, "Financing Educational Programs for Handicapped Children," pp. 18-20.

32. Rossmiller, Hale, and Frohreich, *Educational Programs for Exceptional Children*.

33. Richard Rossmiller and Thomas Moran, *Programatic Cost Differentials for Delaware School Districts* (Gainesville, FL: National Educational Finance Project, 1973); National Educational Finance Project, *Financing the Public Schools of Florida*, unpublished manuscript (Gainesville, FL: Institute for Educational Finance, University of Florida, 1973); Judy A. Schrag, *A Study of Exceptional Children in Idaho: Special Education Needs Assessment Study* (Boise, ID: Department of Public Instruction, 1974); Frank Sorensen, *A Cost Analysis of Selected Public School Systems in Illinois* (Springfield, IL: Office of the Superintendent of Public Instruction, 1973); Philip Jones and William Wilkerson, "Special Education Program Cost Analysis," unpublished manuscript (Bloomington, IN: Department of School Administration, Indiana University, 1972); National Educational Finance Project, *Financing the Public Schools of Kentucky* (Gainesville, FL: National Educational Finance Project, 1974); Governor's School Finance Study Group, *Mississippi Public School Finance* (Jackson, MS: Governor's School Finance Study Group, 1973); National Educational Finance Project, *Financing the Public Schools of South Dakota* (Gainesville, FL: National Educational Finance Project, 1973); Tish Newman Busselle, *The Texas Weighted Pupil Study* (Austin, TX: Texas Education Agency, 1973).

34. Bernstein, et al., *Financing Educational Services*, p. 8.

35. R. W. Bentley, "An Exploration of the Relationships between Expenditures for Educational Programs for Exceptional Children and Expenditures for Regular Education Programs" (Ph.D. dissertation, University of Wisconsin, 1970). (Ann Arbor, MI: University Microfilm No. 71-3449).

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38. Sorenson, A Cost Analysis of Selected Public School Systems in Illinois.

39. William P. McClure, Robert A. Barnham, and Robert A. Henderson, Special Education: Needs--Costs--Methods of Financing (Urbana, IL: Bureau of Educational Research, College of Education, University of Illinois at Urbana-Champaign, 1975).

40. A. L. Clemmons, "An Assessment of Cost Variations in Selected Exemplery Special Education Programs in Six Selected Minnesota School Districts" (Doctoral dissertation, University of New Mexico, 1974).

41. Leigh S. Marriner, "The Cost of Educating Handicapped Pupils in New York City," pp. 82-97.

42. Taylor, "The Special Costs of Special Education."

43. Ernst & Ernst, A Model for the Determination of the Costs of Special Education as Compared with that for General Education (Chicago: Ernst & Ernst, 1974).

44. Kalalik, et al., Services for Handicapped Youth, pp. 123-25.

45. Rossmiller, Hale, and Frohreich, Educational Programs for Exceptional Children, pp. 120-28.

46. Hawaii Department of Education, State Plan for Special Education and Services, pp. 92-105.

47. Arkansas Department of Education, State Plan for Special Education, pp. 21-23.

CHAPTER V

THE RESOURCE-COST MODEL APPROACH TO COST ESTIMATION

In order to overcome the problems surrounding the estimation of costs in special education and to avoid the difficulties encountered by previous studies, the cost estimation approach utilized in this study had to meet three criteria. First, it had to be based on the programmatic decisions, policies, procedures, and relationships in special education. These programmatic aspects needed to be an explicit part of the cost estimation process. Second, it had to function adequately with the lack of nationally applicable program standards and variability in actual practice, as well as account for the cost differences which would result from these variations. Finally, it had to incorporate expected and possible changes in future program practices in the cost estimation methodology, treat the cost effects of these programmatic changes, and deal with the significant uncertainty concerning the future programmatic outcomes in special education.

The Resource-Cost Model Approach

To meet these objectives, a resource-cost model approach was used. The resource-cost model approach offers a methodology for cost estimation in special education which is consistent with the economic theories of the educational production function and the representative firm.

In this approach, a model of the education process is developed which specifies in mathematical form the relationships among students, programs, resources, and decision rules. The approach focuses on the designation of eligible students and the programs they are to receive, and the specification and pricing of the resources to be used in each program as the means of estimating the costs of the educational programs. The outputs of the resource-cost model approach are units of service provided, in contrast with the learning outcomes of students which are normally utilized in the educational production function approach.

The general steps in using the resource-cost model approach to estimate educational costs are as follows:

1. The target population which is to be served is identified and defined.

2. The educational programs to be offered are selected; both direct instructional and indirect or support elements can be included.

3. The types and quantities of resources which comprise one unit of each program are specified. These resources would include such items as personnel, instructional materials and supplies, facilities, equipment, and administrative and other support services.

4. The price of each resource is determined, using actual or estimated market prices for the quantities of each resource to be consumed.

5. The unit price of each program is calculated by summing the price times the quantity for each resource specified for the program.

6. A mathematical resource-cost model of the relationships among the students, resources, and programs and the resultant outputs is constructed. Formal and informal internal decision rules used in the educational system are in-

included (e.g., appropriate educational programs for certain students, class size, teacher/administrator ratios, etc.).

7. The number of units of each program that will be required to provide an education to the target population of students is calculated.

8. The total educational program cost is calculated via the unit price of each program and the required number of units.

This approach results in an estimate of the cost to provide the specified type and quantity of educational programs for an identified population of students. No attempt is made in the resource-cost model approach to measure or estimate student achievement in the programs. This is not the purpose of this approach; rather it concentrates on measuring the costs of the program resources which are or will be provided. A critical assumption implicit in the resource-cost model approach is that the programs result in acceptable educational outcomes for the students.

The resource-cost model approach offers a number of advantages for future cost estimation in education which are not present in other approaches. It is basically a planning approach which can be used for cost estimation. As such, it is oriented toward what is expected (or desired) for the future. Construction of the model of the education process requires explicit specification of the critical assumptions, decisions, and policies which are involved. This leads to a focus and emphasis on the programmatic aspects of the educational process. Costs are derived from the relationships among students, programs, resources, and operating decision rules. While cost estimates may be developed for past, present, or future costs, depending on the data which are employed, the resource-cost model approach is most useful when planning a new future situation and estimating the costs involved. For example, to estimate the future costs for a given educational process, the data to define the target population, programs, resources, prices, and production relationships would all relate to the expected future time period. (These would be, in essence, the normal conditions envisioned in the representative firm theory). This allows the cost estimates to relate to expected future educational programs rather than being limited to extrapolating the past practices and costs.

The resource-cost model approach can also deal directly with changes in the educational process. Because it is a model, it is not restricted to a fixed, historical data base. As new programmatic changes occur or are anticipated, the data concerning these changes can be introduced into the resource-cost model. This allows the model to calculate new cost estimates associated with programmatic changes in such variables as number and type of students to be served, student mix, types of programs, program mix, use of resources, price levels, and student/personnel ratios. The result can be a series of future cost estimates which are dependent upon future events. This capability is an exceedingly useful tool for policy analysis for an uncertain future.

Another very helpful policy use for the resource-cost model approach is in the comparison of alternative educational strategies, programs or assumptions. The model can calculate cost estimates for each alternative being evaluated. While not the only consideration, the cost information, particularly when linked to specific programmatic data, does provide assistance in comparing and making tradeoffs among competing alternatives.

The resource-cost model approach to cost estimation applies at all levels of the educational system. At the lowest level, it can be used to estimate the costs of a specific program in a specific district for a given number of students of a certain type. It can also be used to estimate the costs of all programs of a given type at the district level by aggregating the individual program costs. Costs at the state or federal level can also be estimated by aggregating to these levels as well; the aggregation procedure could apply either to the values for the programmatic data describing the educational process or to the individual district cost estimates.

While not extensive, there have been several examples of the theoretical application of a resource-cost model type of approach to cost estimation in education. Barro[1] describes the theoretical employment of the resource-cost model approach to a school district as a means of representing the operation of the district. It is characterized as "a set of quantitative relationships among variables that enter into the determination of program benefits and costs. The set of relationships is structured so that a description of the school district, either as it is or as it might be, can be translated into estimates of the resources needed to operate the district in a specified manner."[2] In his hypothetical example, the resource requirements for each program (regular, disadvantaged, and handicapped students, occupational training, college preparation) and across each grade level (K-12) are translated into costs via prices and summed to provide the total cost of education for the district. A critical element is the identification of "decision variables," those controlled by the district decision-makers, as an integral part of the model; this allows cost projections to be made under alternative program strategies.

Following this general approach, the Association of School Business Officials developed what is called the Educational Resources Management System (ERMS).[3] The full system is an effort to apply a planning-programming-budgeting-evaluation system to education under another acronym. One aspect of ERMS, however, concerns resource analysis; it is defined as "encompassing those activities by which cost and program data are linked to provide information in the form of resources and cost estimates."[4] The methodology of this resource analysis consists of three sequential components: program definition; determination of resources required; and program costs. Program definition includes the statement of purpose of the program, identification of students to be served, selection of instructional methodology, and determination of support required from other programs. The second step estimates, in non-dollar terms, the necessary resources to operate the program. In the final step, projecting program costs, the resources are organized into a cost element structure (i.e., cost accounting structure); the resource requirements are then translated into dollar costs by use of cost-estimating relationships and a resource-cost model constructed for the program.

A similar approach is used by Levin[5] to determine the cost of a program as part of a cost-effectiveness analysis. The procedure employed is called the "ingredients" approach. "The name derives from the focus on listing at the first step the ingredients or inputs required by the program, and assigning costs to them after all of the ingredients are accounted for."[6] The purpose of this procedure is to force a thorough consideration of all relevant resources as an integral part of the analysis. In addition to the more obvious resources (e.g., personnel, materials, equipment, facilities), Levin also includes the value of client or student time as an explicit resource to be considered in the analysis.

This is a step that the previous formulations of this approach, which focused on resources of a line item budgetary nature, did not include.

The Special Education Planning Model

A resource-cost model of the variables of primary importance in special education and the relationships among these variables has been developed to assist state education agencies to plan for their future special education programs. The model, known as the Special Education Planning Model (SEPM),[7] provides a systematic process for estimating the needs and costs of special education within a state or district. The fundamental variables utilized by the model to estimate the costs of special education are:

> Total population of the age group of interest (e.g., enrollments of school age children)
>
> Handicapping conditions prevalent in the total population (i.e., classification system)
>
> Proportion of handicapped students in the total population that require special education (i.e., incidence rates)
>
> Types of educational programs provided to handicapped students (e.g., resource room, special class)
>
> Resources comprising each program (e.g., personnel, instructional supplies and materials, facilities, equipment, travel, administrative and other support services)
>
> Quantity of each resource in each program
>
> Price of each resource in each program

Allocation of handicapped students to each program

Number of students per one unit of each program (i.e., student/teacher ratios)

The model uses data concerning these student, program, resource, and cost variables and organizes them into production relationships which represent the general structure of special education. Current data are used to initialize the model with existing practices; this establishes the actual situation as the starting point for future cost estimates. Data for future years are based on existing trends in special education as well as anticipated or planned program and cost changes. SEPM combines the variables in a series of sequential calculations which result in cost estimates to serve the projected number of handicapped students in the specified programs consisting of designated resources. Provision is made to include planned or expected changes in both the population and programs in the future, such as declining enrollments, addition of new groups of children to be served, provision of new programs, and shifts in the mix of programs provided. Thus, the cost estimates are based on expectations of actual future program operation, not on an extrapolation of past practices.

The calculation steps in SEPM parallel those of the general resource-cost model approach.[8] They are outlined below and shown schematically in Figure 5.1.

FIGURE 5.1

THE SPECIAL EDUCATION PLANNING MODEL

Total School Age Population* x Incidence Rate (%) of Children in Total Population Needing Special Education by Type of Handicap = Number of Students to Receive Special Education by Type of Handicap

Types of Special Education Programs to be Provided : For Each Program: Resources Comprising the Program x Quantity of Each Resource x Price of Each Resource** = Unit Cost of Each Program

Number of Students to Receive Special Education by Type of Handicap x Percentage of Students by Handicap to be Placed in Each Program*** = Number of Students by Handicap to be Placed in Each Program

Number of Students By Handicap to be Placed in Each Program ÷ Number of Students Per Unit for Each Program and Handicap = Number of Personnel Required for Each Program and Handicap

Number of Units (Personnel) Required for Each Program and Handicap x Unit Cost of Each Program = Total Cost of Special Education for Each Program and Handicap

$\sum$ Total Cost of Special Education for Each Program and Handicap = Total Cost of Special Education

*These projections are done annually for up to ten years.

**An inflation factor is included to adjust for future price level changes.

***These allocations may change over time to show the impact of programatic shifts.

1. The total population in which handicapped students are found is specified (e.g., the K-12 enrollment in public and private schools).

2. The classification system to be used to identify handicapped students is selected along with an expected incidence rate for each category (e.g., EMR: 2.00%; visually handicapped: 0.10%). The classification system specified may be other than by type of handicap, for instance by type of learning needs.

3. The number of students in each handicapping category expected to need special education services is then calculated (total population x incidence rates).

4. The set of special education programs to be provided to handicapped students is determined (e.g., consulting teacher program, resource room, special class).

5. For each program the type and quantity of resources required in the program are selected along with a price for each resource (e.g., one teacher at $12,000, instructional materials at $500/class).

6. The unit price for each program is then calculated by summing the quantity times the price for each resource in the program.

7. The percentage of handicapped students that are to receive each special education program is estimated by type of handicap (e.g., for EMR: 20% in consulting teacher program, 40% in resource rooms, and 40% in special classes).

8. The number of handicapped students to receive each program is then calculated (step 3 x step 7).

9. The number of students per unit in each special education program for each category of handicapped student is specified (e.g., for EMR: 45 in consulting teacher program; 25 in resource rooms; 12 in special classes).

10. The number of units of each program (and personnel) required for each handicapping category is then calculated (step 8 ÷ step 9).

11. The total cost of each program is then calculated from the unit cost times the number of units required (step 6 x step 10).

12. The total cost of special education is then calculated by summing the total cost of the individual programs (Σ step 11).

The output of the SEPM calculations is a series of multi-year projections of the expected future special education programs and the costs of those programs. The projections provide annual estimates of:

Number of students--by classification (handicapping condition) and year

Number of students--by instructional program and year

Number of instructional personnel--by classification and year

Number of instructional personnel--by instructional program and year

Costs of instructional programs--by classification and year

Costs of instructional programs--by instructional program and year

Number of students, number of support personnel, and costs of related services--by type of related service

To summarize, SEPM is a particular resource-cost model of special education. It provides a generalized structure of the special education instruction process; the essential variables and their relationships are established by the model, but the specification of the values of the variables must be supplied by the user. This provides great flexibility in its use as it can be tailored to represent special education programs at all levels of operation. Use of the model requires the delineation of the critical programmatic aspects of special education, both on a current and future basis. The cost projections which result are derived directly from these programmatic variables and relationships. Finally, because SEPM is a planning approach, its orientation is toward the future; the projections which are developed are based on expectations of future special education students and programs.

There are several limitations to this approach, however, which should be noted. Foremost is the dependence of the results of SEPM on the quality of the data used in its operation. Without valid data for the values of the model's variables, the resultant cost projections can be erroneous and misleading. An associated problem can arise in the availability of certain data required by the model. While designed to function with data which are generally readily available, this may not be the case in all educational agencies. Also, the assumptions concerning the future programmatic aspects of special education are not verifiable since they concern events which have not yet occurred. These values are generally based on the professional judgement of special educators and administrators and, as such, are subject to their biases. However, since the approach utilizes a model, alternative values for questionnable variables can easily be substituted to test their impact.

At higher levels of aggregation, particularly state and federal levels, average values of the programmatic variables are generally used. Individual districts, schools, or programs may vary from these average practices. While the aggregated data and results may not apply to a given district's situation, the model itself could be used to project the district's costs by replacing the average data with the specific values for the district.

Finally, the calculation equations in the model assume no economies of scale are present in the special education process. As discussed previously, this is a reasonable assumption for instructional programs operating over a district or larger jurisdiction. However, for other related activities, such as administration, identification and assessment, and certain support activities, this assumption may not be appropriate. In these cases, it is necessary to account for these different types of activities properly; this can generally be done through a careful specification of the data for these items.

Study Methodology

Using SEPM as both a conceptual framework for the special education process and as a calculation tool, two major research tasks were conducted: the development of national cost projections for providing all school aged handicapped students with educational programs in 1980-81; and a sensitivity analysis of the variables used in the projections. These results were also used to review the appropriateness of the resource-cost model approach as a means of estimating the future costs of special education.

The national cost projections are a series of estimates indicating the costs of providing educational programs for all school aged handicapped students under varying possible future conditions. Each projection was based on a specific set of values for the special education variables used in SEPM. The result is a range of possible costs of special education under various student program, resource, and price assumptions. Thus, the alternative assumptions and instructional strategies for special education and their effects on costs are made explicit.

The second task was that of conducting a sensitivity analysis on the SEPM variables used to project the costs of special education. For each quantitative variable (e.g., incidence rates, resource prices, placement patterns, number of students per unit) an investigation was made of the impact of specified changes in the value of that variable on the projected costs of special education. From this analysis an index of cost sensitivity was developed for each variable. These results provided a guide for areas in which to devote the greatest effort to refining the accuracy of the input values, particularly for future years.

The data for the national projections were obtained from a sample of twenty-six states who had used SEPM to develop special education projections at the state level. The sample of states represented a wide diversity in size, population, geography, demographic characteristics, and special education philosophy and programming practices. These states were selected from a larger group of thirty-one states who had received training and assistance in the use of SEPM and who had completed at least one set of special education projections for their state. The selection of the twenty-six states used in this study was based on three criteria: 1) their input data were of reasonable quality and accuracy as determined by a comparison of the student, personnel, and cost projections of the initial year with available data from other state sources; 2) the format of the data was generally comparable with that of other states and was not unduly distorted by individual state idiocyncracies; and 3) the state had completed its projections by an established date (approximately four months following the initial training session).

The data obtained from the selected sample states were first grouped by type of variable. On a variable-by-variable basis the individual state values were analyzed and, where necessary, made comparable (e.g., combining data for two different handicapping categories--blind and partially sighted--into a single category--

visually impaired). To facilitate the nationwide use and comparability of the projections, standardized groupings for the two major qualitative variables--handicapping condition and special education programs--were established. Following this data organization, specific values were developed for each of the SEPM variables. Most likely values for each of the other variables were selected together with reasonable low and high alternative values based on the analysis of the states' reported data. Finally, aggregate national population estimates were obtained from census sources. This process of establishing the values for each of the variables is discussed in detail in the following chapter.

Based on the most likely values, an initial estimate of the total national costs of special education was projected by SEPM and established as the base case. Each of the low and high alternatives values for the variables was utilized in SEPM in turn and a new set of cost projections obtained for each alternative value. Taken together, these projections identify a range of possible future costs of special education under various assumptions.

The sensitivity analyses were carried out to determine the impact of specific changes in the values of the quantitative variables on the total projected costs. This was accomplished by changing the value of each variable from the most likely value to the low and then high alternative values, and then using SEPM to project the new costs using these changed values. The percentage change in the new cost estimate was divided by the percentage change in the value of the variable which caused the change. This resulted in an index of cost sensitivity for each variable. Those variables whose indices were largest were termed relatively sensitive and those whose indices were smallest were said to be relatively insensitive. In addition to the sensitivity indices, the cost impact associated with changes from the most likely value to the low and high alternative values were calculated for each variable. This provided a second measure--dollar amount--of the sensitivity of each variable.

Thus, the results of this study illustrate the application of a resource-cost model approach to the problem of estimating the future costs of special education. National projections were developed which represented the most likely estimate of future costs of providing an appropriate education to all school aged handicapped children in the United States in 1980-81. While subject to refinement, the cost projections are based on the current and expected programming practices and characteristics of the handicapped student population in twenty-six states. In addition to the cost estimates and sensitivity analyses, which are of interest and importance themselves, the approach provides a means of making explicit in the estimation process the key issues, decisions, and assumptions involved in special education and projecting their cost consequences. This direct linkage between programmatic aspects and costs of special education can clarify and assist the policy making process in special education.

Notes for Chapter V

1. S. Barro, "Modeling Resource Utilization in a School District," in *Program Budgeting for School District Planning: Concepts and Applications*, RM-6116-RC, ed. S. Haggart et al. (Santa Monica, CA: Rand Corporation, 1969).

2. Ibid., p. 64.

3. William Curtis, *Educational Resources Management System* (Chicago: Research Corporation of the Association of School Business Officials, 1971).

4. Ibid., p. 104.

5. Henry Levin, "Cost Effectiveness Analysis in Evaluation Research," in *Handbook of Evaluation Research*, ed. Marcia Guttentag and E. Struening (Beverly Hills, CA: Sage Publishing Co., 1975), pp. 89-121.

6. Ibid., p. 100.

7. Peggy L. Hartman, et al., *Special Education Planning Model: User Guide* (Palo Alto, CA: MAC, Inc., 1977).

8. A similar set of factors affecting special education costs is presented by James S. Kakalik, "Issues in Cost and Finance of Special Education," *Review of Research in Education*, vol. 7, forthcoming.

CHAPTER VI

METHODOLOGY FOR DATA ANALYSIS

This chapter provides a description of the sources, model variables, and analysis used to develop data necessary for the utilization of the Special Education Planning Model (SEPM) computer model to estimate the costs of educating all school aged handicapped children in the United States in 1980-81. The research data were analyzed and "most likely" and low and high alternative values for each of the SEPM variables were selected. These values were then used in the model to develop national cost estimates for special education under varying assumptions.

In order to obtain the data needed for the SEPM computer model, several data sources were used. Primary among these were twenty-six states who had used SEPM to develop their own state projections. The values of the SEPM variables which they had established for their current and future special education programs provided the basis for the bulk of the programmatic data for the model. This grounded the resultant projections in the actual and expected state program practices in special education. Other data required by the model were of an aggregate or national total nature (e.g., total student population in grades K-12 in the United States); these data were obtained from other sources which provided them in summary form, eliminating the need for extrapolation to national totals from the group of SEPM user states.

SEPM Variables for Estimating Costs of Instructional Programs[1]

Planning Period

The planning period represents those years for which projections are to be made. In order to make the projections as current as possible, the beginning year of the planning period was selected as 1976-77. This was the most recent complete school year, the year selected by most states in their use of SEPM, and, consequently, the latest year with a relatively complete set of available data on handicapped students, programs, resources, and prices. 1980-81 was selected as the ending year. This allowed a five-year period for new students to be added to special education, for students to be shifted to more appropriate placements, and for programs to expand or contract to meet the student enrollment shifts. Most states in the SEPM group utilized a planning period of approximately this length. Additionally, 1980-81 coincided with the final year of implementation specified in P. L. 94-142, a target date toward which all states were striving.

Age Group

The age group chosen for the national projections was the K-12 school age range. This included children ages 5 through 17. Most states used this age range as the standard group in school attendance and programs were routinely provided for this population. Other age groups of handicapped students received special education services; these included preschool age children (ages 0 to 5) and postschool age students (ages 18 through 21 or higher). However, the types of handicapped students in these other age groups who generally received special education assistance and the programs provided for these students tended to be different from those prevalent in the school age group. Further, very few of the SEPM group of states developed separate projections for either the preschool or postschool age groups; as a result, the data base for these two age groups was inadequate for use in developing national projections. Therefore, the national projections were made for the school age group only.

Total Student Population

The total student population is an estimate of the number of students, both nonhandicapped and handicapped, in a particular age group. This population is estimated for each year of the planning period. The latest enrollment projections from the National Center for Educational Statistics (NCES) were used to estimate the future grade K-12 enrollments. Three different birthrate assumptions were used by the Census Bureau in their basic population estimates which were in turn utilized by NCES in their analyses; this resulted in three different series of annual population estimates, Series I, II, and III.[2] Series II was selected to represent the most likely estimate of future public and private school enrollments, since the completed cohort fertility assumption of 2.1 children per women most closely approximated the latest expected fertility data. Series I at 2.7 children per woman and Series III at 1.7 children per woman provided upper and lower limits and were selected as the high and low alternative values respectively.[3]

However, the Series I, II, and III enrollment projections do not include enrollments in residential schools for handicapped children. The latest available data indicated that there were approximately 133,000 students in such schools.[4] Therefore, this total was added to each of the annual enrollment projections of the three series to arrive at an adjusted enrollment projection. The results are shown in Table 6.1.

Classification Categories

The classification categories are used to identify those students in need of special education and to indicate the handicapping conditions which require special assistance. While groupings other than traditional

TABLE 6.1

PROJECTED ENROLLMENTS IN GRADES K-12
(Regular Day and Residential Schools)

Year	Enrollments (in thousands)		
	Series I (High)	Series II (Most Likely)	Series III (Low)
1976	49,826	49,826	49,826
1977	49,157	49,154	49,152
1978	48,310	48,287	48,270
1979	47,460	47,357	47,279
1980	46,871	46,542	46,281

handicapping categories can be chosen, the categories used by the SEPM group of states were generally the conventional disability categories. An analysis of their choices indicated a great overall similarity, although there were many individual differences among the states as well. Based on these data, ten standard categories were selected for the projections. The standard categories that were selected and examples of the existing state categories that fit into them are shown in Table 6.2. A complete listing of each states' categories, identified by the selected standard categories, is provided in Appendix A, Table A-1.

An effort was made to use the federal reporting categories established by U.S.O.E. as the standardized categories. In all but three cases this approach was feasible on the basis of data utilized by the SEPM group of states: mentally retarded was more commonly separated into educable and trainable retarded categories; deaf and hard of hearing were more frequently combined into a single category; and a multiple handicapped category was necessary.

Incidence Rate

The incidence rate is an estimate of the expected percentage of children with a certain handicap to be found in the total population. Incidence rates for each of the standard classification categories were developed from

TABLE 6.2

STANDARD CLASSIFICATION CATEGORIES

Standard Category (Abbreviation)	Examples of State Categories
Educable Mentally Retarded (EMR)	Educable Mentally Retarded, Educable Mentally Handicapped, Mild Mental Retardation
Trainable Mentally Retarded (TMR)	Trainable Mentally Retarded, Trainable Mentally Handicapped, Moderate Mental Retardation
Hearing Impaired (Hearing)	Hearing Impaired, Hard of Hearing, Deaf, Acoustically Handicapped, Audition
Speech Impaired (Speech)	Speech Handicapped, Communication Disorders, Speech and Language Handicapped, Aphasic
Visually Handicapped (Vision)	Visually Handicapped, Visually Impaired, Blind, Partially Sighted
Seriously Emotionally Disturbed (SED)	Emotionally Disturbed, Severe Emotional Handicap, Behavior Disorders, Severe Behavior Handicap, Autistic
Orthopedically Impaired (Ortho)	Orthopedic, Physically Handicapped, Physical Mobility, Crippled
Other Health Impaired (OHI)	Other Health Impaired, Health Impaired, Homebound, Hospitalized
Specific Learning Disability (SLD)	Specific Learning Disability, Learning Disability, Brain Injured
Multiple Handicapped (Multiple)	Multi-Handicapped, Deaf-Blind, Severely and Profoundly Retarded, Severe Multiple Handicapped

the data provided by the SEPM group of states. States arrived at their incidence rates in various ways: some chose theoretical rates; some chose "prevalence" rates based on the number of handicapped students actually identified; and other states chose modified rates based on the number actually identified plus an estimate of the number of unidentified/unserved handicapped students derived from professional judgements. The most likely values were obtained by calculating the weighted average incidence rate for each category; the weighing was based on the total school age population of each state. The results are shown in Table 6.3. The complete listing of the incidence rates by state for each standard category is provided in Appendix A, Table A-2.

Development of alternative values for the incidence rates was complicated by the interrelationships among the various handicapping categories. The reported incidence rates by category are not necessarily independent; a low incidence rate in one category may be compensated for by a higher rate in another category. To illustrate: a state may report a comparatively low incidence rate for seriously emotionally disturbed (SED) students, but the milder SED students may be classified as specific learning disabled (SLD), and the SLD incidence rate would be correspondingly higher. Similar overlaps occur within subclassifications of mental retardation, between mental

TABLE 6.3

INCIDENCE RATES
(Estimated Percentage of Total K-12 Population)

	Most Likely Values		Alternative Values	
Category	Weighted Average Rates	% of Total Wt. Avg.	Low (Total minus one σ allocated to categories)	High (Total plus one σ allocated to categories)
Total	10.11%	100.0%	7.80%	12.97%
EMR	1.79%	17.7%	1.38%	2.29%
TMR	0.38%	3.8%	0.29%	0.49%
Hearing	0.26%	2.6%	0.20%	0.34%
Speech	3.62%	35.8%	2.79%	4.64%
Vision	0.08%	0.8%	0.06%	0.10%
SED	0.93%	9.2%	0.72%	1.19%
Ortho	0.22%	2.2%	0.17%	0.28%
OHI	0.37%	3.7%	0.29%	0.48%
SLD	2.27%	22.5%	1.75%	2.92%
Multiple	0.19%	1.9%	0.15%	0.24%

retardation and SLD, between speech and hearing, between orthopedically handicapped and other health impaired, and between the multiple category and most other categories. Further, each state had its own definitions of how students are classified in each of the categories.

Therefore, it was necessary to use the total incidence rate for each state (sum of the rates for each category) as the base to avoid the problem of the inter-category relationships on the individual category incidence rates. Alternative values for the total incidence rate were obtained by taking plus and minus one standard deviation around the unweighted average of the total incidence rates for the SEPM group of states. These high and low incidence rates were apportioned among the individual incidence rates for each handicapping category according to the proportion that they represented of the most likely total incidence rate. This procedure is also shown in Table 6.3.

The distortion caused in the calculations by the inter-category relationships was tested by examining plus and minus one standard deviation around the unweighted average of each individual incidence rate. This difficulty was confirmed in the total incidence rate value which was obtained by summing the individual incidence rates which were one standard deviation below the average for each category. This hypothetical lower value for the total incidence rate was well below the present level of handicapped students already being served (5.67% of the total student population based on one standard deviation below the individual averages vs. 7.70% currently being served), a condition never found in any of the SEPM group of states. Use of this figure as an incidence rate would have meant a reduction in the number of handicapped students served by 1980-81 of approximately 1.2 million from the present level. Another possible set of alternative values, the upper and lower values of the range of incidence rates for each individual category, yielded even more extreme results, as would be expected.

Number of Students Served in Beginning Year

To initialize the model, information is required on the number of students served by each classification category in the beginning year of the planning period. These data for 1976-77 were obtained from reports from the Bureau of Education for the Handicapped (BEH), U.S.O.E. The reports contained national totals of the number of handicapped students served (as reported by all states) in both public and private schools and institutions (i.e., the totals reported for P. L. 94-142 and P. L. 89-313). These reports were based on federally mandated child counting procedures in all states and provided the most comprehensive summary information on students in special education. Counts were taken in both October 1976 and in February 1977. The February count showed a gain of approximately 220,000 students over the October count, apparently due to delays early in the year in locating possibly handicapped students, assessing their educational needs, and placing them in special education programs. The more comprehensive February count was selected as the better representation of the number of handicapped students served in 1976-77.

The age group for which these data were available was ages 3-21, which was somewhat different from the school age group to be used in these projections. However, relatively few handicapped students received special education services prior to normal school age and beyond normal graduation age, and those that did were primarily the more seriously handicapped (a relatively nominal number). Therefore, since the 3-5 and 18-21 age populations constituted a small proportion of the reported 3-21 age handicapped population and there were no reliable means of separating the reported data into school age and pre and postschool groups by handicapping category, the 3-21 age reported number of handicapped students served was used to approximate the beginning number of school age handicapped students served.

As indicated in the Classification Categories discussion above, the standard categories used in these projections had three differences from the federal categories which were used by states to report the number of students served in 1976-77. Therefore, the reported numbers of students in certain categories were rearranged to be compatible with the standard categories. The adjustments were: 1) the mentally retarded category was divided between educable mentally retarded (EMR) and trainable mentally retarded (TMR) in proportion to the number of students in each category identified by the SEPM group of states which used the EMR and TMR categories (EMR: 79%; TMR: 21%); 2) deaf and hard of hearing categories were added to form a single category; and 3) a fraction of the students from all categories except speech was allocated to a multiple category. The number of students shifted was equal to the percentage of multiple handicapped students in the total handicapped student population except speech in the SEPM group of states that used multiple as a separate category (2.82%), applied to each of the categories except speech. These calculations are shown in Appendix A, Table A-3. The results are shown in Table 6.4.

Full Service Year and Phase-In Pattern

Full service year indicates the year in which all handicapped students will be receiving some type of special education program. It is the year by which all initially unserved students (as indicated by an incidence rate higher than the beginning number of students served divided by the total student population) will be enrolled

TABLE 6.4

NUMBER OF STUDENTS IN SPECIAL EDUCATION IN 1976-77

Standard Classification Category	Beginning Number of Students
Educable Mentally Retarded	759,865
Trainable Mentally Retarded	201,990
Hearing Impaired	91,178
Speech Impaired	1,341,152
Visually Handicapped	40,085
Seriously Emotionally Disturbed	293,856
Orthopedically Impaired	88,441
Other Health Impaired	133,898
Specific Learning Disability	816,525
Multiple Handicapped	70,392
Total	3,837,382

in a special education program. The full service year is specified for each category. For the national projections, the full service year was chosen as 1980-81 for all categories. This coincided with the last year of the planning period and allowed for the longest phase-in period. Choosing an earlier year would have meant that the unserved population would have been decreased sooner. However, since in the model once full service is reached the category remains at this level for the rest of the years in the planning period, the end result would have been identical.

The phase-in pattern specifies the manner in which full service is reached (i.e., the pattern of annual increases in students to be served). The model offers three options: LAG--small increments in the initial years, but increasingly larger increments in later years (an exponential function); EVEN--even annual increments; and FAST--large increments in the initial years followed by increasingly smaller increments in later years (a logrithmic function). The choice of a phase-in pattern affects only the intermediate years between the beginning and full service years; all patterns yield the same result in the full service year. Therefore, the choice of a phase-in pattern was not critical to the projections. The LAG pattern was selected for all categories since it represented the most common choice of the SEPM group of states.

Types of Instructional Programs

The data for this variable are the various types of instructional programs to be provided to the different categories of handicapped students. The specification should include the full complement of present and future programs to be offered. A standardized set of eight instructional programs for the national projections was established based on a review and analysis of those programs utilized by the SEPM group of states. Overall, there was a general similarity of programs offered among these states, although individual states differed in their specific sets of instructional programs. All states did offer a range of possible placements for handicapped students--from supplemental assistance to full time special education to residential schools. This range was reflected in the standard set of instructional programs. The selected standard programs and examples of individual states' programs that fit into them are shown in Table 6.5. A complete listing of each state's programs identified by the standard set of programs is provided in Appendix A, Table A-4.

Resources, Quantities, and Prices for Instructional Programs

In the resource-cost model methodology used by SEPM, each instructional program is considered to be made up of selected identifiable resources. Each re-

TABLE 6.5

STANDARD INSTRUCTIONAL PROGRAMS

Standard Program (Abbreviation)	Examples of State Programs
Indirect Services (IND SVC)	Aide in Regular Classroom, Consultive Services, Consultant Teacher, Consultive/Diagnostic
Speech and Language Instruction (S & L)	Speech and Language, Supplemental Instruction, Itinerant Instruction, Communication Disorder Specialist
Other Direct Services (ODS)	Consultant-Itinerant, Itinerant Instruction, Individual Instruction, Tutor, Supplemental Instruction
Resource Room (RES RM)	Resource Room, Resource Services Special Resource, Teacher-Consultant
Special Class (SP CLASS)	Self-Contained Classroom (Part or Full-Time), Special Class, District Center, Public Day School
Other Agency Day School (OA DAY)	Tuition/Contract, Private Agency, Private School, Special Day School, Out-of-District
Residential School (RESIDENT)	Residential School, Public Agency, State School, State School for Deaf or Blind, State Institution, Private Residential
Hospital and Homebound (HOSP/HBD)	Hospital, Homebound, Home and Hospital

source is present in a specified quantity in one unit of an instructional program and has a price associated with it. Taken together, these yield a unit price for each instructional program. The data to establish the resources, quantities, and prices came from a review and analysis of the corresponding data utilized by the SEPM group of states. The states' programs were grouped according to the standard set of eight instructional programs. A tally of the most frequently specified resources for each program was made, along with the quantity of the resource per program unit (usually 1.0) and the range of prices associated with the resource. Those resources showing the greatest frequency of use were selected as the most likely resources for each respective instructional program. Other resources, which were used by some, but not most, states were included in the alternative formulations of the resources for the programs. Only in the cases of instructional aides for resource room and special class programs were the quantities of a resource in a single program unit different than 1.0. In both instances, a fractional amount for an aide was used as the most likely quantity for one program unit; the alternative low and high values for quantities of aides per program unit represented the ranges found in the SEPM states' data.

To establish prices, resources were divided into three groups--personnel, non-personnel, and cost per student. The personnel related resources consisted of teacher salaries, aide salaries, and fringe benefits. Due to the great variability in salary schedules across the country, a national average teacher salary ($12,628 in 1976-77)[6] was used instead of an average of those salaries reported by the SEPM group of states. Alternative values for teacher salaries were established at plus and minus ten percent of the most likely value (low = $11,365; high = $13,890). Aide salaries were established as a proportion of the most likely teacher salary. In SEPM states which reported using aides, the mean aide salary to teacher salary ratio was .44 to 1; ths ratio was used to calculate the most likely value for aide salary. Alternative values for the aide salary were calculated using the low and high aide/teacher salary ratios found in the SEPM group of states (.29 and .64 to 1) applied to the most likely teacher salary. Similarly, fringe benefits were calculated based on the benefit levels reported by the SEPM states. The mean level of benefits as a percentage of salary was used as the most likely value (13%), while the range of benefits reported in the SEPM state data (7% to 20%) were used in the calculation of the alternative values for this resource. These operations are summarized and translated into prices in Table 6.6.

To establish prices for the non-personnel resources --instructional materials, travel, and maintenance and

TABLE 6.6

PERSONNEL RESOURCES AND PRICES

Teacher Salary

Most Likely	Alternative Values Low (-10%)	 High(+10%)
$12,628*	$11,365	$13,890

Aide Salary

	Most Likely	Alternative Values Low	 High
Aide/Teacher Salary Ratio	.44	.29	.64
Aide Salary (based on most likely teacher salary)	$5,556	$3,662	$8,081

Fringe Benefits

	Most Likely	Alternative Values Low	 High
Benefit/Salary Percentage	13%	7%	20%
Benefits (based on corresponding teacher salary)	$1,642	$796	$2,778

*See note 6.

operation expenses--data from the SEPM group of states were used directly. For those resources used in a given instructional program by most states, the most likely values for the prices were taken to be the average of the prices reported by states for those resources. Resources used by a minority of the states in a given instructional program were assigned a most likely price of zero, thus eliminating the resource from the most likely formulation. Low and high alternative values for prices for these resources were established by reviewing the number of states using a resource in a specific instructional program, the likelihood of the generalized use of this resource by other states, the range of reported prices, and the distribution of the reported prices. The resultant most likely and alternative values for the resources, quantities, and prices are shown in Table 6.7. The procedures and underlying data for establishing these values are presented in Appendix A, Table A-5.

The final type of resource used by the SEPM group of states was an average cost per student in a particular instructional program. This designation was most common in programs whose budgets and operations were controlled by agencies other than the public schools--other agency day schools and residential schools. While providing less detail than a full specification of program resources, frequently the average cost per student was the

TABLE 6.7

RESOURCES AND PRICES FOR INSTRUCTIONAL PROGRAMS

Program	Resource	Most Likely	Low	High
IND SVC	Teacher	$ 12,628	$ 11,365	$ 13,890
	Benefits	1,642	796	2,778
	Materials	305	200	400
	Travel	837	670	1,000
	Maint. & Op.	0	0	236
	Total	$ 15,412	$ 13,031	$ 18,304
S&L	Teacher	$ 12,628	$ 11,365	$ 13,890
	Benefits	1,642	796	2,778
	Materials	582	300	1,000
	Travel	855	627	1,000
	Maint. & Op.	0	0	261
	Total	$ 15,707	$ 13,088	$ 18,929
ODS	Teacher	$ 12,628	$ 11,365	$ 13,890
	Benefits	1,642	796	2,778
	Materials	606	300	1,000
	Travel	913	782	1,000
	Maint. & Op.	0	0	180
	Total	$ 15,789	$ 13,243	$ 18,848
RES RM	Teacher	$ 12,628	$ 11,365	$ 13,890
	Aide (quantity)	(.30/unit)	(0/unit)	(1.0/unit)
	(price)	($ 5,556)	($ 3,662)	($ 8,081)
	cost	1,667	0	8,081
	Benefits	1,858	796	4,394
	Materials	617	400	1,000
	Maint. & Op.	616	0	1,437
	Total	$ 17,386	$ 12,561	$ 28,802
SP CLASS	Teacher	$ 12,628	$ 11,365	$ 13,890
	Aide (quantity)	(.44/unit)	(.25/unit)	(1.0/unit)
	(price)	($ 5,556)	($ 3,662)	($ 8,081)
	cost	2,445	915	8,081
	Benefits	1,959	860	4,394
	Materials	721	500	1,000
	Maint. & Op.	754	0	1,760
	Total	$ 18,507	$ 13,640	$ 29,125
OA DAY	Avg.Cost/Stud.	$ 3,687	$ 2,500	$ 5,000
RESIDENT	Avg.Cost/Stud.	$ 10,390	$ 8,000	$ 14,000
HOSP/HBD	Teacher	$ 12,628	$ 11,365	$ 13,890
	Benefits	1,642	796	2,778
	Materials	378	284	500
	Travel	704	528	1,000
	Total	$ 15,352	$ 12,973	$ 18,168

only cost information which the states could provide for these programs. For these programs, the most likely value for the price was established as the mean value of the average cost per student for those states reporting. In a similar fashion to the non-personnel resources described above, the alternative values were determined through an analysis of the range and distribution of the reported costs per student for these programs. The results are shown in Table 6.7 and the underlying data and procedures are given in Appendix A, Table A-5.

As can be seen from the specification of resources and prices for the instructional programs developed from the data reported by the SEPM group of states, the resultant costs were special education program costs. That is, the resources included were only those used for special education programs; therefore, the projected costs were only for those programs also. The costs for the mainstream type programs--indirect services, speech and language, other direct services, and resource room--were for the special education component of those students' education; the costs of the regular education programs for these students were not included. The costs for the public school replacement programs--special class and hospital and homebound--were for the complete instructional component for these students, but did not include any administrative or other common costs. These costs were not excess costs either since the average costs of regular education instruction were not deducted. Finally, the costs of the non-public school replacement programs--other agency day school and residential school--represented the total costs for educating these students (which in this case were also the program costs), but, again, were not excess costs since the average costs of regular education for these students were not deducted here either. Thus, the cost projections were for the specifically identifiable costs of special education programs, not the total costs or excess costs of educating handicapped children.

Inflation Factor

In order to reflect changes in the price levels in future years, SEPM uses an inflation factor. This variable specifies the average annual rate of inflation of the initial prices expected over the planning period. To establish a value for this variable, the weighted average inflation factor (weighted by the total student population of each state) for the SEPM group of states was selected. Alternative values of plus and minus one standard deviation from the unweighted average inflation factor for these states were also chosen. These results are presented in Table 6.8.

Placement Patterns

Placement pattern refers to the distribution of handicapped students into instructional programs; it is

TABLE 6.8

INFLATION FACTORS

Most Likely (weighted average rate)	6.77%
Low Alternative (minus one standard deviation)	5.51%
High Alternative (plus one standard deviation)	8.23%

expressed for each handicapping category as a percentage of the total number of handicapped students served via each instructional program. Thus a matrix is created to express the placement values in which the categories are rows, the programs are columns, and percentages of students are in the cells. SEPM uses two such matrices--beginning placement pattern (in the initial year of the planning period) and expected placement pattern (in a later year of the planning period). This allows the model to begin with an actual situation and then show movements to reflect anticipated programmatic trends in the future.

The procedure for establishing the most likely values was based directly on the responses of the SEPM group of states in providing these data. As discussed previously, each state's handicapping categories and instructional programs were classified into the respective standard sets used in this analysis. Then, the numbers of students by handicapping category were organized by placement in each instructional program for both the beginning and expected years in the states' planning periods. One distinction was necessary in analyzing these placement numbers--that of primary placement vs. additional services. Primary placement referred to the single program in which the students received the major component of their instruction; the sum of the primary placement percentages for a given handicapping category, then, always totaled 100%. In addition, some states reported that various handicapped students had been and were expected to receive supplemental services to accompany their primary instructional program (e.g., certain EMR students being provided with speech and language instruction in addition to being placed in a special class). Thus, the placement percentages for additional services when added to those of the primary placement yielded a total of greater than 100%.

To establish the values for the placement percentages, the number of students by handicap in primary placements were totaled for the SEPM group of states. These totals were used as a base and divided into the number of students in each instructional program--both primary placement and additional services--to arrive at a percentage of students in each program. This yielded weighted average placement patterns for the SEPM states. This procedure was done for both the beginning (1976-77) and expected (1980-81) years. The results are shown in Table 6.9. Both the beginning year and expected year percentages are shown together so that the expected shift over time in placement patterns may be observed.

Alternative values for placement patterns were only needed for the 1980-81 values since the 1976-77 values represented the current actual situation. The wide variety of placement patterns utilized by the SEPM states and their incompatibility when reported as percentages of

TABLE 6.9

MOST LIKELY PLACEMENT PERCENTAGES -- 1976-77 AND 1980-81

CATEGORY	YEAR	PROGRAM								TOTAL
		IND SVC	S & L	ODS	RES RM	SP CLASS	OA DAY	RESIDENT	HOSP /HBD	
EMR	76-77	4.7	5.8	1.5	36.4	60.7	0.2	1.4	-	110.7
	80-81	5.0	8.1	2.3	46.7	50.0	-	0.7	-	112.8
TMR	76-77	2.4	7.8	0.5	0.2	82.2	1.8	14.8	0.9	110.6
	80-81	2.8	14.0	1.1	0.8	84.9	1.6	11.9	0.7	117.8
HEARING	76-77	2.9	41.3	17.3	20.3	38.3	0.3	22.3	-	142.7
	80-81	5.8	32.5	33.4	22.4	29.9	0.1	12.3	-	136.4
SPEECH	76-77	0.1	97.2	0.1	0.8	1.8	-	-	-	100.0
	80-81	0.2	97.7	0.1	1.2	0.7	-	0.1	-	100.0
VISION	76-77	3.3	0.7	33.4	20.2	28.2	0.2	14.4	0.1	102.5
	80-81	5.0	0.9	37.6	25.2	26.0	0.4	10.8	0.1	106.0
SED	76-77	6.0	4.8	3.5	22.5	64.8	0.7	7.4	1.7	111.4
	80-81	4.8	5.2	5.5	34.6	52.9	1.2	5.8	1.1	111.1
ORTHO	76-77	1.8	9.7	35.7	20.5	34.4	0.5	5.7	5.4	113.7
	80-81	4.8	13.2	31.8	28.2	30.8	0.4	4.5	5.7	119.4
OHI	76-77	4.3	2.1	2.7	12.7	60.9	0.1	9.2	14.8	106.8
	80-81	4.3	4.6	3.3	25.6	44.8	-	7.7	19.0	109.3
SLD	76-77	8.3	4.5	10.4	61.4	24.1	1.3	0.1	-	110.1
	80-81	10.3	8.9	14.3	65.7	18.1	0.9	0.1	-	118.3
MULTIPLE	76-77	4.9	6.8	3.4	2.7	63.6	4.2	28.6	0.2	114.4
	80-81	4.0	15.2	4.0	4.9	70.0	2.5	21.8	0.5	122.9

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students in different programs made a detailed statistical analysis of the variations in state placement patterns difficult. Rather, the major programmatic trend of mainstreaming was used as the basis for establishing alternative values for the 1980-81 placement patterns. As can be seen by Table 6.9, the most likely values generally show a shift toward less restrictive placements between the 1976-77 and 1980-81 values. As one set of alternative values--a more conservative future pattern than the most likely values--no change in the present pattern of placements was selected (i.e., 1980-81 placement percentages equalled 1976-77 placement percentages). On the other side of the most likely values, another placement pattern was established which incorporated a greater shift of students into programs considered less restrictive and a greater use of additional services, primarily speech and language instruction. While somewhat arbitrary, this second set of alternative expected placement values represented a reasonable, although more extensive, use of mainstreaming practices in the future. These values are shown in Table 6.10.

Two other data elements are required by SEPM in this step--expected year and phase-in pattern of the expected placement pattern. These elements are analogous to those discussed earlier under full service. Since

TABLE 6.10

ALTERNATIVE 1980-81 PLACEMENT PERCENTAGES
(GREATER MAINSTREAMING TRENDS)

CATEGORY	PROGRAM								TOTAL
	IND SVC	S & L	ODS	RES RM	SP CLASS	OA DAY	RESI-DENT	HOSP /HBD	
EMR	8.0	15.0	3.0	55.0	40.0	-	-	-	121.0
TMR	6.0	20.0	4.0	6.0	85.0	1.0	7.5	0.5	130.0
HEARING	6.0	34.0	40.0	25.0	25.0	-	10.0	-	140.0
SPEECH	0.5	98.5	-	0.5	0.5	-	-	-	100.0
VISION	9.0	1.0	40.0	30.0	20.0	-	10.0	-	110.0
SED	5.0	10.0	10.0	43.0	40.0	1.0	5.0	1.0	115.0
ORTHO	7.0	20.0	35.0	35.0	25.0	0.5	3.0	3.5	129.0
OHI	7.0	5.0	10.0	30.0	40.0	-	5.0	15.0	112.0
SLD	15.0	10.0	15.0	70.0	15.0	-	-	-	125.0
MULTIPLE	5.0	20.0	6.0	10.0	65.0	2.5	20.0	0.5	129.0

their impact is on the intermediate years and they do not affect the end results, the selection of their values was not crucial. Therefore, the most common response of the SEPM group of states was used for these items: expected year was selected as the last year in the planning period, 1980-81; and the phase-in pattern chosen was LAG.

Number of Students Per Unit

The final type of data required by SEPM to develop projections for instructional programs is the number of students in each instructional program and by handicapping condition. These data form a matrix identical to that of the placement patterns discussed above, in which the rows represent categories and the columns represent programs. A value for the number of students per unit is necessary in each cell in which there is a placement indicated in either the beginning or expected placement patterns. If there are no students of a given handicapping category shown to be receiving a certain program, then no number of students per unit is reported.

To establish the values for the numbers of students per unit, the responses from the SEPM group of states were again utilized. The individual categories and programs of each state were grouped into the respective standard sets of categories and programs used in this analysis. The number of students per unit specified by the states were then organized by instructional program for each handicapping category. Next, a mean number of students per unit was calculated for each instructional and handicapping category. These mean values were selected as the most likely numbers of students per unit. In two programs--Other Agency Day School and Residential School--this calculation procedure was not necessary because the resources for these programs were specified as a cost per student. Since the value for this variable represents a number of students which can be served by one unit of an instructional program and the unit for these two programs was one student, the appropriate number was one. The values of the most likely numbers of students per unit which were established are shown in Table 6.11.

Alternative values for the numbers of students per unit were established by adding and subtracting one standard deviation from the mean value for each non-unitary value in the most likely number of students per unit. These values are also presented in Table 6.11.

SEPM Variables for Estimating Costs of Related Services[7]

Related services are those services of a developmental, corrective, or supportive nature which are provided to help handicapped students to benefit from the instructional programs in which they are enrolled. By definition they are not instructional (in an academic

TABLE 6.11

NUMBER OF STUDENTS PER UNIT OF EACH INSTRUCTIONAL PROGRAM

CATEGORY	EST	PROGRAM							
		IND SVC	S & L	ODS	RES RM	SP CLASS	OA DAY	RESI-DENT	HOSP /HBD
EMR	ML	88	67	33	22	14	1	1	-
	LOW	40*	49	22	15	11	1	1	-
	HIGH	140	85	44	29	17	1	1	-
TMR	ML	88	60	24	22	11	1	1	6
	LOW	40*	39	13	13	9	1	1	5*
	HIGH	140	81	30*	31	13	1	1	8
HEARING	ML	79	65	20	16	9	1	1	-
	LOW	35*	47	10	8	6	1	1	-
	HIGH	98	83	30	24	12	1	1	-
SPEECH	ML	75	67	25	19	10	-	1	-
	LOW	40*	51	25	9	7	-	1	-
	HIGH	110*	83	25	29	13	-	1	-
VISION	ML	86	72	23	17	9	1	1	8
	LOW	32	51	11	9	6	1	1	8
	HIGH	140	93	35	25	12	1	1	8
SED	ML	69	73	25	21	10	1	1	8
	LOW	32*	56	18*	13	7	1	1	5*
	HIGH	118	90	33	29	13	1	1	13
ORTHO	ML	76	65	22	18	10	1	1	7
	LOW	20*	46	18	10	7	1	1	5*
	HIGH	140	84	26	26	13	1	1	10
OHI	ML	78	54	24	19	11	1	1	8
	LOW	20*	43*	17	13*	8	1	1	5*
	HIGH	140	65	31	26	14	1	1	13

	ML	75	66	28	25	12	1	1	-
SLD	LOW	32*	55	20	17	9	1	1	-
	HIGH	120	77	36	33	15	1	1	-
	ML	130	70	16	25	7	1	1	8
MULTIPLE	LOW	110*	51	10*	14	5	1	1	6
	HIGH	150*	89	24	35*	9	1	1	10

* IN SOME INSTANCES, DUE TO THE SMALL NUMBER OF OBSERVATIONS, PLUS OR MINUS ONE STANDARD DEVIATION FROM THE MEAN VALUE EXCEEDED THE RANGE OF VALUES FOUND AMONG THE REPORTED STATE DATA. IN THESE CASES, THE END VALUE IN THE RANGE WAS USED TO AVOID AN INPUT VALUE MORE EXTREME THAN WAS PRESENT IN THE BASE DATA.

sense), but they can provide essential assistance to handicapped students. In some instances, the distinction between instruction and related services is not clear, and, in fact, varies from state to state. Two types of related services can be distinguished: specific related services are those which are associated with a certain handicapping category (e.g., special transportation for TMR students); and nonspecific related services are those which are provided to benefit all handicapped students (e.g., inservice training for teachers, assessment and educational evaluation).

The data for related services provided by the SEPM group of states were much less reliable than those of the instructional programs. Only nine states out of the twenty-six reported any specific related services and only thirteen reported any nonspecific related services. There was, therefore, a shortage of data on which to base national projections. Further, different state definitions of the various related services resulted in wide variations in the input data estimates of both the students to receive certain services and the costs of those services. Finally, there were inconsistencies among the states as some considered certain related services to be included in the structure and cost of an instructional program, while others reported these related services separately.

However, even with these limitations, it was felt that the development of national projections for the most frequently reported related services would be useful. While perhaps the most difficult area in which to assess costs properly, related services are an important part of special education, are explicitly included in P. L. 94-142 and many state statutes, and their costs should not be forgotten. These projections of related services, even with their shortcomings, provide some indication of the general magnitude of the costs involved and can serve as a basis for developing improved input data and more refined cost estimates. Because of the uncertainty of the data concerning related services, low and high alternative values were established arbitrarily at plus and minus ten percent of the most likely values for both specific and nonspecific related services.

Specific Related Services

From the nine states reporting data for specific related services, a total of twenty-seven individual services were identified; each handicapping category, except speech, had at least one specific related service associated with it. However, there was such great variation among the various specific related services reported that to prevent misleading results on the national basis, only those specific related services which were mentioned in a given category by four or more states were selected for the projections. This yielded nine services. Practically all of the states reporting these specific related services used an average cost per student as the price specification and this resource was selected for use in the projections. The input values for all of the variables for specific related services (average cost per student and 1976-77 and 1980-81 percentages of each category of handicapped students to receive each service) were chosen as the mean values for the states reporting these data. The results are shown in Table 6.12 and the underlying data are presented in Appendix A, Table A-6.

Nonspecific Related Services

Fourteen different types of nonspecific related services were reported by the thirteen states which utilized this item. Again, there was little consistency among the states, either for the actual nonspecific related services reported or the manner in which they were specified. A cutoff of five states selecting a given nonspecific related services was used as the basis for inclusion. This yielded three nonspecific related services for the projections. To obtain a common basis for selecting input values for each service, all of the reported cost formulations were put in a similar format (i.e., cost per student, cost per teacher, or cost per administrator), although many were specified by the states in other manners. Variables indicating the magnitude of each service in

TABLE 6.12

SPECIFIC RELATED SERVICES

Category	Service	Price ($/Student)	% of Students Receiving		States Reporting
			1976-77	1980-81	
EMR	Vocational Services	$ 412	7%	27%	4
TMR	Special Transportation	$ 777	46%	55%	6
Hearing	Special Transportation	$ 596	31%	37%	4
Vision	Special Transportation	$ 571	30%	49%	4
SED	Psychological Services	$ 375	12%	55%	4
Ortho	Physical Therapy	$ 472	15%	34%	5
	Occupational Therapy	$ 449	3%	16%	5
	Special Transportation	$ 769	28%	64%	6
Multiple	Special Transportation	$ 521	49%	85%	4

1976-77 and 1980-81 were also selected based on the states' data; they were chosen to be compatible with the cost formulation of the given nonspecific related service. The mean values of the states reporting were selected as the most likely values for these variables. The results are shown in Table 6.13 and the underlying data are given in Appendix A, Table A-7.

To summarize, to develop national cost projections for providing an appropriate education for all school aged handicapped students in 1980-81, a resource-cost model of special education was used, the Special Education Planning Model (SEPM). The variables in this model--students, instructional programs, resources, prices--and the relationships among them represented a mathematical formulation of the special education process. Data from twenty-six states which had used SEPM to develop their own state special education cost estimates were used as the data base from which national cost projections were generated. From the data prepared by each state, information required by the model concerning both the characteristics of the current handicapped student population served and the existing programming practices was obtained, along with the states' expectations for their future special education students and programs. For each variable in the model, three different values were established from the states' data: the

TABLE 6.13

NONSPECIFIC RELATED SERVICES

Service	Price	Service Level		States Reporting
		1976-77	1980-81	
Student Assessment	$93/student	1,918,500 students (50% of total)	4,705,000 students (100% of total)	7
LEA Administration	$22,650/administrators	2900 administrators (50% of total)	7100 administrators (100% of total)	7
Inservice Training	$303/teacher	89,500 teachers (50% of total)	216,000 teachers (100% of total)	5

most likely value, which represented an assessment of the most probable value; a low alternative value, which represented a lower limit; and a high alternative value which represented an upper limit.

In the following chapter, these values for the model variables were used in SEPM to develop national projections for special education in 1980-81 of handicapped students, instructional personnel, and costs. Three major projections were developed which correspond to the different values established in the data analysis process: most likely projections; low alternative projections; and high alternative projections. The most likely projections represented the best estimate of future special education costs in 1980-81 based on the available data. The low alternative utilized the set of substitute values which yielded a lower total cost than the most likely set (i.e., reduced population projections, lower incidence rates, lower quantities and prices for resources, placement in more mainstreamed programs, higher numbers of students per unit, lower inflation rate). These projections represented a lower boundary of total national special education costs in 1980-81. Conversely, the high alternative utilized the other set of substitute input values which resulted in a higher total cost than the most likely projections. The high alternative represented an upper boundary of the total national costs of special education in 1980-81.

Each set of projections was directly dependent upon the values utilized for each of the model variables, which made the establishment of these values the critical step in the development of national cost projections for special education. The cost estimates are only as valid as the values of the variables which were used in the model, and these included many assumptions about the future of special education which are presently unknown--numbers and types of handicapped students to be served, appropriate instructional programs and related services, resources to be utilized and their prices, and number of students per unit. Some of these aspects can be influenced by policy decisions at the local, state, and federal levels. The resource-cost model approach provides the ability to estimate the cost impact of possible policy decisions before they are put into practice. Since the model frames the policy issues and questions in terms of the programmatic aspects of the special education process, careful attention to the program data which are utilized to generate the cost estimates is essential.

Notes for Chapter VI

1. A complete description of each variable for SEPM and the considerations which go into the selection of values for the variables are found in Peggy L. Hartman et al., Special Education Planning Model: User Guide (Palo Alto, CA: MAC, Inc., 1977), pp. 11-53.

2. National Center for Educational Statistics, Projections of Educational Statistics to 1985-86 (Washington, D.C.: U.S. Government Printing Office, 1977), p. 131, provides a description of the composition of each of these series.

3. Ibid., pp. 14, 133, 134, provide the annual enrollment projections for Series II, III, and I, respectively.

4. W. Vance Grant and C. George Lund, Digest of Educational Statistics: 1975 Edition, NCES-76-211 (Washington, D.C.: U.S. Government Printing Office, 1976), p. 38.

5. Statistics reported by the Bureau of Education for the Handicapped, U.S.O.E. for the purpose of P.L. 94-142.

6. National Center for Educational Statistics, Projection of Educational Statistics to 1985-86, p. 64.

7. Hartman, et al., Special Education Planning Model: User Guide, pp. 55-85.

CHAPTER VII

ESTIMATION OF THE COSTS OF SPECIAL EDUCATION

Based on the analysis of the student and program data provided by the twenty-six state sample, national projections of the costs of educating all school aged handicapped students in the United States in 1980-81 were developed. The results of these projections, generated by use of the Special Education Planning Model (SEPM), are presented in this chapter. Three sets of projections were developed--a most likely estimate derived from the most likely values established for the model variables from the states' data, and a low estimate and a high estimate obtained by using the alternative low and high values established for the model variables, respectively. To begin, the most likely projections, which represent the best estimate of the 1980-81 costs of special education, are presented and reviewed; the cost estimates and major factors causing cost changes in special education over the planning period are analyzed. Then, the most likely projections are compared with the low and high alternative projections. Both the differences among the three cost projections and the underlying reasons for the cost differences are discussed.

It is important to reiterate that the cost estimates which were developed are for the special education program costs--the complete costs of the specifically identifiable activities known as special education. These consist of the costs of specialized instruction for handicapped children and the related or support services that are involved. The special education program costs were selected for these projections since it was felt that they provided the best information concerning the resources devoted to special education and their costs. Other educational costs which are incurred by handicapped students, such as the cost of regular instruction for mildly handicapped students who receive limited or part-time special education services or the costs of general school or district activities which cover all students (e.g., school or district administration, business services, food services, central support staff) have been specifically excluded from these projections. Therefore, the total costs of educating handicapped students are in reality higher than indicated by these projections, but these costs are accounted for in regular education costs. Additionally, the special education program costs which were projected are not the excess costs of special education, since the equivalent costs of providing a regular education program for those handicapped students in separate instructional settings have not been deducted from the cost estimates.

Most Likely Projections

The most likely values for the input variables which were established in the previous chapter were used to develop a set of projections using the SEPM computer model. This resulted in an estimate of the special education instructional program costs, the total number of students, and the instructional personnel required to serve all school aged handicapped children in the United States in 1980-81. Projections for selected related services were also included.

For the cost estimates, two different price levels were projected. The first was the constant 1976-77 dollar cost of the various special education programs. In this cost estimate the price level was maintained constant in order to demonstrate the cost effects of the various programmatic changes without the added complexity of price level changes. These estimates are identified as "constant" dollar estimates. The other price level that was projected was the current cost, which was the constant cost adjusted for an anticipated rise in the price level due to an assumed annual inflation rate. (The most likely inflation rate was estimated to be 6.77%.) These estimates are identified as the "inflated" dollar estimates.

Costs of Instructional Programs

The national costs for special education were estimated in two dimensions--by handicapping category and by instructional program. The complete results are shown in Tables 7.1 and 7.2 respectively. In these estimates, there is a slight growth in the total constant dollar costs from $4.635 billion in 1976-77 to $5.027 billion in 1980-81; this represents an increase of $392 million in the five-year planning period or an overall increase of 8.5 percent. However, in inflated dollars, the growth is expected to be almost $2.0 billion as the total costs escalate to $6.533 billion.

A review of the projections in Table 7.1 indicates that four of the categories experience relatively large cost changes during this period, while the other remain fairly steady. A brief summary of those categories with larger cost changes (expressed in constant 1976-77 dollars) and the related student and programmatic changes is shown below.

Category	Cost Change in Constant $ ($ 000,000)	% Cost Change	% Student Change	Programmatic Trends
SED	+ $198	+ 30%	+ 47%	Use of lower cost programs (Res Rm up, Sp Class down)
SLD	+ $183	+ 24%	+ 29%	Shift into lower cost programs; greater use of additional services

TABLE 7.1

SCHOOL AGE

COSTS -- BY CLASSIFICATION AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR	966433	960002	955094	951879	950952
TMR	613945	597065	569813	534664	494608
HEARING	326245	325219	323690	317722	301716
SPEECH	361235	367955	384144	409820	445461
VISION	101893	99125	94616	88729	81943
SED	663692	684287	727606	788578	861351
ORTHO	163328	163873	166162	170210	176078
OHI	323597	328248	339502	356456	378188
SLD	770310	785744	821952	877920	953587
MULTIPLE	343882	346945	355169	367546	382868
TOTAL (CONSTANT $)	4634560	4658463	4737748	4863524	5026752
TOTAL (INFLATED $)	4634560	4973838	5400943	5919669	6532549

Note: Cost projections by type of classification are shown in constant 1976-77 dollars.

TABLE 7.2

SCHOOL AGE

COSTS -- BY INSTRUCTIONAL PROGRAM AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

TYPE OF PROGRAM	PRICE PER UNIT	YEAR				
		76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	15412	27880	28912	31240	34985	40441
SPEECH & LANGUAGE INSTR	15707	344972	353752	374219	407015	453586
OTHER DIRECT SERVICES	15789	110949	116664	129596	151195	183862
RESOURCE ROOM	17385	694843	722972	786653	890720	1044021
SPECIAL CLASS	18506	1996464	1992726	1996612	1999480	1989801
OTHER AGENCY DAY SCHOOL	3687	80059	79429	78658	77426	75303
RESIDENTIAL SCHOOL	10390	1316329	1298843	1270863	1225105	1150962
HOSPITAL & HOMEBOUND	15352	63096	65199	69943	77635	88811
TOTAL (CONSTANT $)		4634592	4658497	4737784	4863561	5026787
TOTAL (INFLATED $)		4634592	4973874	5400985	5919714	6532594

Note: Cost projections by type of program are shown in constant 1976-77 dollars.

Category	Cost Changes in Constant $ ($ 000,000)	% Cost Change	% Student Change	Programmatic Trends
Speech	+ $84	+ 23%	+ 26%	Increase in number of students
TMR	- $119	- 19%	- 12%	Decline in Resident program

The SED category shows the largest cost increase of $198 million; this represents a 30 percent increase in costs over the 1976-77 level. However, the number of SED students served grows by 47 percent over the 1976-77 level. The reason for this difference is the greater use of programs with lower per student costs for these students (i.e., an increasing percentage of SED students in resource rooms and a decreasing percentage in special classes by 1980-81). Similarly, the SLD category shows a shift into lower cost per student programs; this change in placement pattern more than compensates for the greater use of additional services for SLD students. The increase in costs for the speech category is related directly to the increase in the total number of speech students to be served. The decline in the TMR category shows a reverse pattern from that of SED; costs decline at a greater rate than do the number of students served. The reason is that the reduction in the number of TMR students served by the high cost per student residential program has a large impact on the projected costs for this category.

A similar review of Table 7.2 reveals four instructional programs that experience significant cost changes, while the others remain essentially constant. The programmatic cost changes (expressed in constant 1976-77 dollars) are summarized below.

Program	Cost Change in Constant $ ($ 000,000)	% Cost Change	% Student Change	Categorical Trends
Res Rm	+ $349	+ 50%	+ 49%	Increases in SLD, EMR, and SED students
S & L	+ $109	+ 31%	+ 31%	Increase in Speech students plus additional services for SLD and EMR
ODS	+ $73	+ 66%	+ 67%	Increase in Hearing, SED and SLD students
Resident	- $165	- 13%	- 13%	Decrease in TMR, Hearing and EMR students

The resource room program has by far the largest cost increase. This is due primarily to the large increase in SLD, EMR, and SED students expected in this program. The speech and language instruction program also has its cost increases traceable to an increase in the number of students to be serviced, both speech students and other handicapped students receiving additional speech services. The other direct service program cost increases result from an increase in SLD, SED, and hearing students, with most of these students receiving other direct services as a primary rather than an additional service. The decline in the costs of the residential program is caused by the increase in students served in this type of program.

Students

Projections of school age students to be served in special education are presented on both an unduplicated basis (each student counted only once regardless of the number of programs or services received) and on a duplicated basis (each program or service received counted separately). The results are shown in Table 7.3 and 7.4 respectively.

The unduplicated projections show the total number of students growing from 3,837,382 in 1976-77 (or 76% of the estimated handicapped population based on incidence rates) to 4,705,396 in 1980-81 (and 100% of the estimated handicapped population). This represents an increase of 868,014 students over the five-year period and a total growth of 23 percent. The growth in students is led by the following categories: Speech (343,668 students, 26% increase); SLD (239,978 students, 29% increase); SED

TABLE 7.3

SCHOOL AGE — **NUMBER OF STUDENTS -- BY CLASSIFICATION AND YEAR**

CLASSIFICATION CATEGORIES		YEAR				
		76-77	77-78	78-79	79-80	80-81
EMR	NUMBER OF STUDENTS SERVED	759865	762641	774777	797499	833102
EMR	PERCENT OF STUDENTS SERVED	85	87	90	94	100
EMR	NUMBER OF STUDENTS UNSERVED	132020	117216	89560	50191	0
TMR	NUMBER OF STUDENTS SERVED	201990	198017	192073	184766	176860
TMR	PERCENT OF STUDENTS SERVED	107	106	105	103	100
TMR	NUMBER OF STUDENTS UNSERVED	-12651	-11232	-8582	-4809	0
HEARING	NUMBER OF STUDENTS SERVED	91178	93733	99517	108541	121009
HEARING	PERCENT OF STUDENTS SERVED	70	73	79	88	100
HEARING	NUMBER OF STUDENTS UNSERVED	38370	34067	26029	14587	0
SPEECH	NUMBER OF STUDENTS SERVED	1341152	1368694	1434205	1538471	1684820
SPEECH	PERCENT OF STUDENTS SERVED	74	77	82	90	100
SPEECH	NUMBER OF STUDENTS UNSERVED	462549	410680	313784	175852	0
VISION	NUMBER OF STUDENTS SERVED	40085	39522	38782	37971	37234
VISION	PERCENT OF STUDENTS SERVED	101	101	100	100	100
VISION	NUMBER OF STUDENTS UNSERVED	-224	-199	-152	-85	0
SED	NUMBER OF STUDENTS SERVED	293856	306616	334066	375970	432841
SED	PERCENT OF STUDENTS SERVED	63	67	74	85	100
SED	NUMBER OF STUDENTS UNSERVED	169526	150516	115003	64450	0
ORTHO	NUMBER OF STUDENTS SERVED	88441	89338	91866	96134	102392
ORTHO	PERCENT OF STUDENTS SERVED	81	83	86	92	100
ORTHO	NUMBER OF STUDENTS UNSERVED	21176	18801	14365	8051	0
OHI	NUMBER OF STUDENTS SERVED	133898	137070	144432	156038	172205
OHI	PERCENT OF STUDENTS SERVED	73	75	81	89	100
OHI	NUMBER OF STUDENTS UNSERVED	50458	44800	34230	19183	0
SLD	NUMBER OF STUDENTS SERVED	816525	836540	882747	955427	1056503
SLD	PERCENT OF STUDENTS SERVED	72	75	81	89	100
SLD	NUMBER OF STUDENTS UNSERVED	314525	279255	213367	119576	0
MULTIPLE	NUMBER OF STUDENTS SERVED	70392	71838	75276	80748	88430
MULTIPLE	PERCENT OF STUDENTS SERVED	74	77	82	90	100
MULTIPLE	NUMBER OF STUDENTS UNSERVED	24277	21555	16469	9230	0
TOTAL	NUMBER OF STUDENTS SERVED	3837382	3904009	4067741	4331565	4705396
TOTAL	PERCENT OF STUDENTS SERVED	76	79	83	90	100
TOTAL	NUMBER OF STUDENTS UNSERVED	1200262	1065693	814302	456451	0

TABLE 7.4

SCHOOL AGE NUMBER OF STUDENTS -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	142072	147132	158627	177242	204311
SPEECH & LANGUAGE INSTR	1468391	1505738	1592623	1731649	1929388
OTHER DIRECT SERVICES	176498	185753	206636	241396	293875
RESOURCE ROOM	918830	955083	1037230	1171280	1368358
SPECIAL CLASS	1241579	1236823	1234546	1229650	1215148
OTHER AGENCY DAY SCHOOL	21714	21543	21334	21000	20424
RESIDENTIAL SCHOOL	126692	125009	122316	117912	110776
HOSPITAL & HOMEBOUND	31588	32690	35187	39214	45033
TOTAL	4127364	4209771	4408499	4729343	5187313

(138,985 students, 47% increase); EMR (73,237 students, 10% increase). Also of interest is the indication that more TMR and vision students are being served currently than the total expected number of such students estimated from the incidence rate. (This is shown by the greater than 100% served and negative number of unserved students in Table 7.3.) The anomaly may be caused by one or more of several possibilities: inconsistency between two different reporting sources--the incidence rates were derived from those reported by the SEPM group of states, while the number of students served in 1976-77 was obtained from information reported to the U. S. Office of Education by all states; the estimated incidence rates, which are theoretical numbers, may be too low to reflect the real situation for these two categories; there may have been an overclassification of students into these categories for the implied handicapping conditions in the incidence rates; or some combination of these situations. In any event, the data point out a possible conflict or inconsistency in these two categories. The number of TMR and vision students being served is reduced to the 100% level by 1980-81.

The duplicated count of students is shown on the basis of instructional programs to allow the cumulative summary of students receiving multiple program placements. Because of growth in the additional services, the duplicated count of students is shown growing at a greater pace than the unduplicated count. As shown in Table 7.4, the total number of students grows from 4,127,364 in 1976-77 to 5,187,313 in 1980-81 or 26 percent over the five-year period. This growth comes mostly from three programs: speech and language instruction (460,997 students, 31% increase); resource room (449,528 students, 49% increase); and other direct services (117,377 students, 67% increase).

Personnel

The projected personnel requirements are also estimated both by handicapping category and by instructional program. The results are shown in Table 7.5 and 7.6 respectively. They show a slight overall growth projected for both teachers and aides. Estimates of the number of teachers required grow from 182,759 in 1976-77 to 216,507 in 1980-81, an increase of 33,748 or 18 percent in the five year period. Aide requirements grow 5,864 in the same period, from 59,450 to 65,314 or an increase of 10 percent. The growth of both teachers and aides is generally spread proportionally over the various handicapping categories and instructional programs. By categories, the largest growth areas are: SLD (11,026 teachers); SED (8,510 teachers); and speech (4,415 teachers). For instructional programs, the major projected growth areas are: resource room (20,085 teachers, 6,026 aides);

TABLE 7.5

SCHOOL AGE **NUMBER OF INSTRUCTIONAL PERSONNEL -- BY CLASSIFICATION AND YEAR**

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
CERTIFIED	46927	46919	47304	48130	49500
NON-CERTIFIED	18267	18184	18171	18234	18396
TMR					
CERTIFIED	15775	15539	15215	14842	14470
NON-CERTIFIED	6646	6538	6386	6208	6024
HEARING					
CERTIFIED	6438	6610	6998	7602	8429
NON-CERTIFIED	2054	2076	2130	2202	2276
SPEECH					
CERTIFIED	22508	22859	23723	25079	26923
NON-CERTIFIED	1231	1198	1135	1023	837
VISION					
CERTIFIED	2373	2347	2316	2286	2269
NON-CERTIFIED	694	684	670	653	638
SED					
CERTIFIED	23675	24513	26293	28891	32185
NON-CERTIFIED	9322	9619	10247	11136	12213
ORTHO					
CERTIFIED	6319	6387	6572	6886	7345
NON-CERTIFIED	1640	1654	1695	1765	1868
OHI					
CERTIFIED	11062	11299	11851	12715	13902
NON-CERTIFIED	3529	3552	3617	3701	3781
SLD					
CERTIFIED	40947	41869	44014	47364	51973
NON-CERTIFIED	13231	13414	13857	14516	15340
MULTIPLE					
CERTIFIED	6735	6958	7469	8301	9511
NON-CERTIFIED	2836	2925	3130	3461	3941
TOTAL					
CERTIFIED	182759	185300	191755	202096	216507
NON-CERTIFIED	59450	59844	61038	62899	65314

TABLE 7.6

SCHOOL AGE NUMBER OF INSTRUCTIONAL PERSONNEL -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES					
CERTIFIED	1809	1876	2027	2270	2624
NON-CERTIFIED	0	0	0	0	0
SPEECH & LANGUAGE INSTR					
CERTIFIED	21963	22522	23825	25913	28878
NON-CERTIFIED	0	0	0	0	0
OTHER DIRECT SERVICES					
CERTIFIED	7027	7389	8208	9576	11645
NON-CERTIFIED	0	0	0	0	0
RESOURCE ROOM					
CERTIFIED	39968	41586	45249	51235	60053
NON-CERTIFIED	11991	12478	13575	15371	18017
SPECIAL CLASS					
CERTIFIED	107882	107680	107890	108045	107522
NON-CERTIFIED	47467	47380	47472	47541	47311
OTHER AGENCY DAY SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
RESIDENTIAL SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
HOSPITAL & HOMEBOUND					
CERTIFIED	4110	4247	4556	5057	5785
NON-CERTIFIED	0	0	0	0	0
TOTAL					
CERTIFIED	182759	185300	191755	202096	216507
NON-CERTIFIED	59458	59858	61047	62912	65328

speech and language instruction (6,915 teachers); and other direct services (4,618 teachers). No personnel are projected for the other agency day school or residential school programs because their resource specification data (average cost per student) did not include a personnel count.

Related Services

Those related services which were projected are shown in Table 7.7. For these services (which are not a comprehensive or exhaustive listing of the probable related services which may be offered to school aged handicapped students by 1980-81), the total cost estimate in 1980-81 is $1.072 billion in constant 1976-77 dollars and $1.393 billion in inflated dollars. The greatest cost services are student assessment at $438 million (constant) and local education agency administration at $161 million (constant).

Comparison with Low and High Alternative Projections

Costs

In addition to the most likely projections, two alternative projections were developed which reflected the range of possible future special education costs for school aged handicapped students in 1980-81. The low and high projections were obtained by using the alternative values of each model variable, established in the pre-

TABLE 7.7

SCHOOL AGE

SUMMARY: STUDENTS, PERSONNEL, COSTS FOR RELATED SERVICES
(COSTS IN THOUSANDS OF DOLLARS,CONSTANT 1976-77)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
VOC SERV					
STUDENTS	53190	68637	100720	151524	224937
PERSONNEL	0	0	0	0	0
COSTS	21914	28278	41496	62427	92674
TMR					
SP TRANS					
STUDENTS	92915	92869	93539	94969	97273
PERSONNEL	0	0	0	0	0
COSTS	72194	72159	72679	73790	75581
HEARING					
SP TRANS					
STUDENTS	28265	29619	32641	37555	44773
PERSONNEL	0	0	0	0	0
COSTS	16845	17652	19454	22382	26684
VISION					
SP TRANS					
STUDENTS	12025	12607	13845	15719	18244
PERSONNEL	0	0	0	0	0
COSTS	6866	7198	7905	8975	10417
SED					
PSY SERV					
STUDENTS	35262	49978	83182	142116	238062
PERSONNEL	0	0	0	0	0
COSTS	13223	18741	31193	53293	89273
ORTHO					
P T					
STUDENTS	13266	15098	19016	25379	34813
PERSONNEL	0	0	0	0	0
COSTS	6261	7126	8975	11978	16431
O T					
STUDENTS	2653	3841	6338	10382	16382
PERSONNEL	0	0	0	0	0
COSTS	1191	1724	2845	4661	7355

TABLE 7.7
(continued)

SP TRANS					
STUDENTS	24763	28230	35643	47682	65530
PERSONNEL	0	0	0	0	0
COSTS	19042	21708	27409	36667	50392
MULTIPLE					
SP TRANS					
STUDENTS	34492	37786	45015	57008	75165
PERSONNEL	0	0	0	0	0
COSTS	17970	19686	23452	29701	39160
ASSESS					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	178420	204334	256163	333906	437564
LEA ADMN					
STUDENTS	0	0	0	0	0
PERSONNEL	2900	3320	4160	5420	7100
COSTS	65684	75197	94223	122762	160814
INSERV					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	27118	30951	38617	50116	65448
TOTAL COST					
CONSTANT $	446728	504754	624411	810658	1071793
INFLATED $	446728	538925	711816	986697	1392855

vious chapter, that gave the lowest and and highest resultant costs. Since this procedures was followed for each variable in turn, the cost results reflected a compounding of the effects of the low and high alternative values (i.e., lowest total student population times the lowest incidence rates, with the lowest use of resources, lowest prices, lowest inflation factor, least expensive placement patterns, and highest number of students per instructional unit). This process, then, yielded the boundary or extreme cost conditions under consistently low or high assumptions about the future, rather than probable estimates of what costs would be. A comparison of these low and high cost estimates with those of the most likely conditions is shown below. Summaries of the results for the most likely, low, and high projections for 1980-81 by both handicapping category and instructional program are provided in Tables 7.8 and 7.9 respectively.

Type of Costs	Price Level	Most Likely*	Low*	High*
Instructional Programs	Constant $ Inflated $	$5,027 $6,533	$2.164 $2.682	$13.742 $18.856
Related Services	Constant $ Inflated $	$1.072 $1.393	$0.977 $1.211	$ 1.190 $ 1.632

*dollars in billions for 1980-81

TABLE 7.8

SUMMARY COMPARISON OF MOST LIKELY, LOW, AND HIGH PROJECTIONS BY CLASSIFICATION

CLASSIFICATION	USA ML	USA LOW	USA HIGH
	80-81	80-81	80-81
EMR			
STUDENTS	833102	638678	1073345
CERTIFIED PERSONNEL	49500	29068	88539
COSTS (CONSTANT)	950952	382398	2757278
TMR			
STUDENTS	176860	134215	229668
CERTIFIED PERSONNEL	14470	9688	22109
COSTS (CONSTANT)	494608	215398	1128850
HEARING			
STUDENTS	121009	92562	159361
CERTIFIED PERSONNEL	8429	4562	18506
COSTS (CONSTANT)	301716	134496	993563
SPEECH			
STUDENTS	1684820	1291239	2174814
CERTIFIED PERSONNEL	26923	16103	49115
COSTS (CONSTANT)	445461	210908	1005755
VISION			
STUDENTS	37234	27769	46871
CERTIFIED PERSONNEL	2269	1134	4823
COSTS (CONSTANT)	81943	37184	218939
S[illegible]D			
STUDENTS	432841	333223	557765
CERTIFIED PERSONNEL	32185	16971	65792
COSTS (CONSTANT)	861351	366906	2462323
ORTHO			
STUDENTS	102392	78678	131239
CERTIFIED PERSONNEL	7345	4132	13554
COSTS (CONSTANT)	176078	74347	455525
OHI			
STUDENTS	172205	134215	224981
CERTIFIED PERSONNEL	13902	7536	26935
COSTS (CONSTANT)	378188	153503	991674
SLD			
STUDENTS	1056503	809917	1368632
CERTIFIED PERSONNEL	51973	30718	97868
COSTS (CONSTANT)	953587	397917	2819587
MULTIPLE			
STUDENTS	88430	69421	112490
CERTIFIED PERSONNEL	9511	5600	15147
COSTS (CONSTANT)	382868	191387	908692
TOTAL			
STUDENTS	4705396	3609917	6079166
CERTIFIED PERSONNEL	216507	125512	402388
COSTS (CONSTANT)	5026752	2164444	13742186
COSTS (INFLATED)	6532549	2682374	18855792

TABLE 7.9

SUMMARY COMPARISON OF MOST LIKELY, LOW, AND HIGH PROJECTIONS BY INSTRUCTIONAL PROGRAM

TYPE OF PROGRAM	USA ML	USA LOW	USA HIGH
	80-81	80-81	80-81
INDIRECT SERVICES			
STUDENTS	204311	230178	228912
CERTIFIED PERSONNEL	2624	1839	6881
COSTS (CONSTANT)	40441	23964	125949
SPEECH & LANGUAGE INSTR			
STUDENTS	1929388	1576909	2373696
CERTIFIED PERSONNEL	28878	19032	46719
COSTS (CONSTANT)	453586	249090	884343
OTHER DIRECT SERVICES			
STUDENTS	293875	272596	282195
CERTIFIED PERSONNEL	11645	8216	16717
COSTS (CONSTANT)	183862	108804	315081
RESOURCE ROOM			
STUDENTS	1368358	1182226	1474725
CERTIFIED PERSONNEL	60053	38820	97302
COSTS (CONSTANT)	1044021	487617	2802492
SPECIAL CLASS			
STUDENTS	1215148	777962	1898682
CERTIFIED PERSONNEL	107522	55406	224340
COSTS (CONSTANT)	1989801	755737	6533902
OTHER AGENCY DAY SCHOOL			
STUDENTS	20424	6803	34155
CERTIFIED PERSONNEL	0	0	0
COSTS (CONSTANT)	75303	17007	170774
RESIDENTIAL SCHOOL			
STUDENTS	110776	61715	194300
CERTIFIED PERSONNEL	0	0	0
COSTS (CONSTANT)	1150962	493719	2720199
HOSPITAL & HOMEBOUND			
STUDENTS	45033	27236	52205
CERTIFIED PERSONNEL	5785	2199	10429
COSTS (CONSTANT)	88811	28527	189474
TOTAL			
STUDENTS	5187313	4135625	6538870
CERTIFIED PERSONNEL	216507	125512	402388
COSTS (CONSTANT)	5026787	2164465	13742214
COSTS (INFLATED)	6532594	2682400	18855824

The results show the extremes of the low and high estimates and the wide variations due to the differing input values. For instructional programs there is a seven to one ratio between the low and high total costs. The low estimate for 1980-81 is less than half of the most likely estimate, while the high estimate is approximately three times the most likely estimate.

To understand why such large differences occur, it is necessary to review the other projections of students and personnel, as well as key variables for the three sets of estimates. Since the projected costs are reflections of the series of input decisions, assumptions, and data, the impact on costs of the values selected (most likely, low, high) for each of the variables can be better understood by analyzing these other indicators. All comparisons shown below are for 1980-81. The full sets of projections for the low and high alternatives are provided in Appendix B.

Students

Due to the differing input data for the total student population and the incidence rate estimates for handicapping conditions, the various projections of the number of handicapped students in special education in 1980-81 are significantly different. The most likely projection shows a growth of approximately 900,000 students over the 1976-77 situation, while the high estimate shows a gain of

2,200,000 students and the low estimate a decrease of 200,000 students. These large differences in the size of the population to be served represent one of the major causes of the cost differences.

	Type of Count	Most Likely	Low[a]	High[a]
Handicapped Students	Unduplicated[b]	4,705	3,610	6,079
	Duplicated[c]	5,187	4,136	6,539

a. Students in thousands in 1980-81

b. See Report A-1, Number of Students--By Classification and Year, Appendix B for detail by classification for low and high projections

c. See Report A-2, Number of Students--By Instructional Program and Year, Appendix B for detail by program for low and high projections

Number of Students per Instructional Unit

The number of students per unit by type of instructional program for each of the projections also has wide variations. In the largest programs--speech and language instruction, resource room, and special class--the range from low to high values is approximately two to one. These differences have a large impact on the number of personnel required under each of the projections. The range of the number of students per instructional program for each of the three projections averaged across all handicapping categories is given on the following page.

Type of Program	Average Number of Students Per Unit for All Categories		
	Most Likely	Low	High
Indirect Services	78	125	33
Speech & Language	67	83	51
Other Direct Services	25	33	17
Resource Room	23	30	15
Special Class	11	14	8
Hospital & Homebound	8	12	5
Overall Average	24	32	16

Instructional Personnel

The different numbers of students projected to be served in 1980-81 coupled with the variation in the number of students per instructional unit for each type of projection yield vastly different estimates of the personnel required to serve all school aged handicapped students. Once again, the low estimate projects a reduction from the 1976-77 situation of 182,759 teachers and 59,450 aides; in this case a decline of 57,247 teachers and 45,602 aides. The high estimate indicates a requirement of more than double the present number of teachers and over five times the number of aides in 1980-81.

Type of Personnel	Most Likely	Low	High
Teachers[a]	216,507	125,512	402,388
Aides[a]	65,314	13,848	321,642

a. See Reports B-1 and B-2, Number of Instructional Personnel, Appendix B for detail of personnel requirements by classification and program for low and high projections.

Thus, a major reason for the cost differences among the three projections is made evident with this comparison. Each teacher represents one cost unit of an instructional program. Since the high projection has over three times the number of teachers than the low projection, the number of cost units for the high projection is substantially greater.

Average Instructional Cost per Student (All Programs)

As an overall measure of the cost differences among the three projections, the average instructional cost per handicapped student was calculated for each projection. While providing no detail, these figures provide a summary indication of the effects of the programmatic and price inputs for each of the projections. These costs represent a composite for all handicapped students in all special education programs, ranging from relatively low cost per student programs, such as speech and language instruction, to the very costly residential programs. The results are simply the average program costs under each set of assumptions. As discussed earlier, they do not represent either the full costs or excess costs of educating handicapped students.

Price Level	Average Special Education Program Cost per Student 1980-81		
	Most Likely	Low	High
Constant $	$1,068	$600	$2,261
Inflated $	$1,388	$743	$3,102

These average cost figures represent differing values for prices, use of resources, placement patterns, and numbers of students per instructional unit for each of the projections. The range from high to low is approximately four to one, while the most likely to low range is about two to one. Thus, the effect of compounding consistently high or low input data and assumptions is made evidence in the widely varying average cost per student.

These comparisons of the most likely, low alternative, and high alternative projections show large differences in the estimated costs to serve all school aged handicapped students in 1980-81. The differences result from significant variations in the input data and assumptions used for each projection. The effects on the projected costs of certain key variables in the SEPM resource-cost model--number of students to be served, number of students per instructional unit, and personnel requirements--illustrate the critical importance of the underlying programmatic data.

The most likely cost estimates developed in this study indicate that a dramatic increase in funding is necessary to meet the recent federal and state mandates for providing an appropriate education to handicapped students. The estimated expenditures of 1976-77 of $4.485 billion will need to rise to approximately $8.0 billion in inflated dollars in 1980-81 to serve all school aged handicapped students in an appropriate manner. This would be a substantial increase of approximately $3.5 billion, or more than the full authorization for federal funding established in P. L. 94-142. Thus, it appears that if the most likely estimates are reasonably accurate, significant increases in funding support will be required by federal, state, and local sources.

However, the extent of the possible funding requirements will depend upon the actual program practices and procedures that are to be utilized in special education in the upcoming years. The fundamental causes of the level of the estimated costs and the differences among the three sets of cost projections which were developed lie in the programmatic aspects which are represented in SEPM by the model variables and their values. Changes in the assumed practices will cause changes in the projected costs. In order to investigate the importance of each variable to the special education cost projections, a sensitivity analysis is conducted in the following chapter. In this analysis the effects on the cost estimates of changes in the values of each variable are determined and compared. This provides an indication of the variables of greatest consequence to the future estimated costs of special education.

CHAPTER VIII

SENSITIVITY ANALYSIS

The cost projections for special education developed in this study indicated a most likely cost in 1980-81 for educating all school aged handicapped students of approximately $8.0 billion. However, the low and high alternative projections, which were also developed, showed that there was a large range of possible costs around this most likely estimate, that the magnitude of the cost estimates was directly dependent upon the assumed future programmatic policies and practices, and that there was uncertainty about the future practices which were expected to occur in special education. These programmatic aspects were represented in the Special Education Planning Model (SEPM), a resource-cost model used to develop the cost projections, by the values specified for the model variables. In order to obtain a better understanding of the importance of each variable in SEPM on the cost estimates and to explore the effects of changing the values of the variables to simulate the future uncertainty, a sensitivity analysis was conducted for each of the model variables.

The results of the sensitivity analyses are presented in this chapter. First, the methodological procedures used for the sensitivity analyses are described. Next, sensitivity indices, which provide a relative each of the variables. Additionally, the use of low and high values tested the effect of both positive and negative changes from the base value. Second, the new cost projections were used to obtain a finer breakdown of the cost differences between the most likely and the low and the high cost projections discussed in the previous chapter. The relative dollar cost which could be associated with the change of the value of each variable from the most likely level to a low or high level was determined.

Eighteen separate sensitivity analysis projections were produced for special education instructional program costs and four separate projections for related services. For instructional programs, these included low and high projections for the following variables: total student population (nonhandicapped and handicapped); incidence rates for handicapping conditions; personnel resource costs; non-personnel resource use and costs; average cost per student resources; inflation factor; expected placement patterns; number of students per instructional unit; and use of instructional aides. For the related services projections, the price level and the number of students or service level were varied for both the selected specific and nonspecific related services.

To compare the effects of changes in each variable, the percentage change in the projected costs was divided

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by the percentage change in the value of the variable. This change ratio was termed the sensitivity index.

$$\text{Sensitivity Index} = \frac{\frac{C_i - C_o}{C_o}}{\frac{V_i - V_o}{V_o}}$$

where: C_i = Projected costs with new input value
C_o = Base costs
V_i = New value of variable
V_o = Base value of variable

A sensitivity index of less than one indicated that a given percentage change in the value of a variable caused a lesser percentage change in the projected costs. A sensitivity index of greater than one indicated that the percentage cost change was greater than the percentage change in the value of the variable. A sensitivity index of one indicated that there was an equal percentage change in the value of the variable and the projected costs.

For four of the nine variables for instructional programs, in which categorical or programmatic input values were subdivided, it was useful to calculate two types of sensitivity indices--a total cost index and a category/program index. These variables were incidence rate (with a subdivision by category) and average cost per student, number of students per instructional unit, and the use of instructional aides (all with subdivisions by program). For these variables, sensitivity indices based on the cost of the individual categories or programs were calculated along with a sensitivity index based on the total cost of all categories or programs. In other words, for the category/program sensitivity index the change in the value of each subdivision of the variable was compared with the costs for the individual category or program; for the total cost sensitivity index, these same changes in the values of the subdivisions of the variable were compared with the changes in the total special education costs. For example, with the incidence rate variable, a new value (e.g., low alternative value) was selected to replace the most likely incidence rate for the EMR category and new cost projections were developed using this input value. The percentage change in the value of the incidence rate was compared with: 1) the percentage change in the projected cost of the EMR category alone to obtain the category sensitivity index; and 2) the percentage change in the overall cost of special education to obtain the total cost sensitivity index. This procedure allowed a determination of the effects of changes in values of the variables directly on a single category or program, as well as the impact on the total costs of special education.

Only in one case was it not possible to calculate a sensitivity index for a variable. This was for the expected placement pattern (specified as percentages of students of each category assigned to each program). The change from the base value to alternative values required both positive and negative changes simultaneously across each category/program combination. (Some programs gained in the percentage of students of each category assigned to them while others lost). Consequently, neither a single meaningful percentage change in the value of the input variable nor a sensitivity index could be calculated. The new cost projections were still developed, however, in order to determine the dollar impact of the low and high estimates of this variable.

Sensitivity Indices

The results of the sensitivity analyses and the development of sensitivity indices are presented in this section. For each variable (and subdivision by category or program) a table shows the most likely and alternative input values along with the percentage change in the input values, the type of index (either total or category/program), the most likely and alternative costs in 1980-81 along with the percentage cost change, and the ratio of the percentage cost change to the percentage change in the input value (sensitivity index). Except for the inflation factor variable, the costs used in the calculation of the sensitivity indices were in constant 1976-77 dollars. This was done to have the entire cost change be due to the change in the input value of the variables without introducing price level changes as well.

Total Student Population

The results of the sensitivity analysis for the total student population variable are shown in Table 8.1. Each of the low and high alternative values were substituted for the most likely value and new cost projections developed using each alternative value. The percentage change between the most likely and low value was a negative 0.56%, while the percentage change between the most likely and high value was a positive 0.71%. The total cost sensitivity index was the only type calculated for this variable since there were no subdivisions by either category or program involved. The most likely cost projection of $5,026,752,000 was taken as the base cost; the low alternative cost of $4,998,568,000 represented a change in the projected cost of a negative 0.56% and the high alternative cost of $5,062,326,000 represented a change in the projected cost of a positive 0.71%. The sensitivity index for each alternative was calculated by dividing the percentage cost change by the percentage change in the input value of the variable being examined.

For both the low and high alternative values for the total student population, the total cost sensitivity index was 1.00. This indicated that changes in the value of this variable were reflected directly in the projected

TABLE 8.1

SENSITIVITY ANALYSIS RESULTS--TOTAL STUDENT POPULATION

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Total Population	Low	46,542,000	46,281,000	- 0.56%	Total	$5,026,752	$4,998,568	- 0.56%	1.00
Total Population	High	46,542,000	46,871,000	+ 0.71%	Total	$5,026,752	$5,062,326	+ 0.71%	1.00

costs. For example, a 1% decrease in the assumed future total student population would result in a 1% decrease in the total projected costs. The index remained at 1.00 for both the low and high alternative values which showed that the effect on costs of changing the input value was the same for both positive and negative variations. This same result, equal sensitivity indices for both positive and negative changes around the base value, was also found for all of the other variables as well.

Incidence Rate

Three separate groups of sensitivity indices were calculated for this variable: the total cost sensitivity index for the total incidence rate for both low and high alternative values; category sensitivity indices for each individual handicapping category for both low and high alternative values; and the total cost sensitivity indices for each individual handicapping category for both low and high alternative values. The results are given in Table 8.2.

The total incidence rate for both low and high alternative values had a sensitivity index of 1.00 in relation to the total costs of special education. This result confirmed the logical expectation that the total costs depended directly upon the total number of students to be served, given a constant pattern of instructional

TABLE 8.2

SENSITIVITY ANALYSIS RESULTS--INCIDENCE RATE

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Incidence Rate Total	Low	10.11%	7.80%	- 22.85%	Total	$5,026,752	$3,884,232	- 22.73%	.99
Incidence Rate Total	High	10.11%	12.97%	+ 28.29%	Total	$5,026,752	$6,449.530	+ 28.30%	1.00
Incidence Rate									
EMR	Low	1.79%	1.38%	- 22.91%	Category	$ 950,952	$ 733,134	- 22.91%	1.00
TMR	"	0.38%	0.29%	- 23.68%	"	$ 494,608	$ 377,486	- 23.68%	1.00
Hearing	"	0.26%	0.20%	- 23.08%	"	$ 301,716	$ 232,071	- 23.08%	1.00
Speech	"	3.62%	2.79%	- 22.93%	"	$ 445,461	$ 343,343	- 22.92%	1.00
Vision	"	0.08%	0.06%	- 25.00%	"	$ 81,943	$ 61,448	- 25.01%	1.00
SED	"	0.93%	0.72%	- 22.58%	"	$ 861,351	$ 666,858	- 22.58%	1.00
Ortho	"	0.22%	0.17%	- 22.73%	"	$ 176,078	$ 136,055	- 22.73%	1.00
OHI	"	0.37%	0.29%	- 21.62%	"	$ 378,188	$ 296,433	- 21.62%	1.00
SLD	"	2.27%	1.75%	- 22.91%	"	$ 953,587	$ 735,127	- 22.91%	1.00
Multiple	"	0.19%	0.15%	- 21.05%	"	$ 382,862	$ 302,277	- 21.05%	1.00
Incidence Rate									
EMR	High	1.79%	2.29%	+ 27.93%	Category	$ 950,952	$1,216,583	+ 27.93%	1.00
TMR	"	0.38%	0.49%	+ 28.95%	"	$ 494,608	$ 637,832	+ 28.96%	1.00
Hearing	"	0.26%	0.34%	+ 30.77%	"	$ 301,716	$ 394,546	+ 30.77%	1.00
Speech	"	3.62%	4.64%	+ 28.18%	"	$ 445,461	$ 571,015	+ 28.19%	1.00
Vision	"	0.08%	0.10%	+ 25.00%	"	$ 81,943	$ 102,417	+ 24.99%	1.00
SED	"	0.93%	1.19%	+ 27.96%	"	$ 861,351	$1,102,170	+ 27.96%	1.00
Ortho	"	0.22%	0.28%	+ 27.27%	"	$ 176,078	$ 224,088	+ 27.27%	1.00
OHI	"	0.37%	0.48%	+ 29.73%	"	$ 378,188	$ 490,625	+ 29.73%	1.00
SLD	"	2.27%	2.92%	+ 28.63%	"	$ 953,587	$1,226,613	+ 28.63%	1.00
Multiple	"	0.19%	0.24%	+ 26.32%	"	$ 382,862	$ 483,641	+ 26,32%	1.00

TABLE 8.2
(continued)

SENSITIVITY ANALYSIS RESULTS--INCIDENCE RATE

Model Variable					1980 Costs ($000)				Sensi-tivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Incidence Rate									
EMR	Low	1.79%	1.38%	- 22.91%	Total	$5,026,752	$4,808,934	- 4.33%	.19
TMR	"	0.38%	0.29%	- 23.68%	"	"	$4,909,630	- 2.33%	.10
Hearing	"	0.26%	0.20%	- 23.08%	"	"	$4,957,107	- 1.39%	.06
Speech	"	3.62%	2.79%	- 22.93%	"	"	$4,924,634	- 2.03%	.09
Vision	"	0.08%	0.06%	- 25.00%	"	"	$5,006,257	- 0.41%	.02
SED	"	0.93%	0.72%	- 22.58%	"	"	$4,832,259	- 3.87%	.17
Ortho	"	0.22%	0.17%	- 22.73%	"	"	$4,986,729	- 0.80%	.04
OHI	"	0.37%	0.29%	- 21.62%	"	"	$4,944,997	- 1.63%	.08
SLD	"	2.27%	1.75%	- 22.91%	"	"	$4,808,292	- 4.35%	.19
Multiple	"	0.19%	0.15%	- 21.05%	"	"	$4,946,167	- 1.60%	.08
Incidence Rate									
EMR	High	1.79%	2.29%	+ 27.93%	Total	$5,026,752	$5,292,383	+ 5.28%	.19
TMR	"	0.38%	0.49%	+ 28.95%	"	"	$5,169,976	+ 2.85%	.10
Hearing	"	0.26%	0.34%	+ 30.77%	"	"	$5,119,582	+ 1.85%	.06
Speech	"	3.62%	4.64%	+ 28.18%	"	"	$5,152,306	+ 2.50%	.09
Vision	"	0.08%	0.10%	+ 25.00%	"	"	$5,047,226	+ 0.41%	.02
SED	"	0.93%	1.19%	+ 27.96%	"	"	$5,267,571	+ 4.79%	.17
Ortho	"	0.22%	0.28%	+ 27.27%	"	"	$5,074,762	+ 0.96%	.04
OHI	"	0.37%	0.48%	+ 29.73%	"	"	$5,139,189	+ 2.24%	.08
SLD	"	2.72%	2.92%	+ 28.63%	"	"	$5,299,778	+ 5.43%	.19
Multiple	"	0.19%	0.24%	+ 26.32%	"	"	$5,127,531	+ 2.00%	.08

program assignments. Likewise, for the categories, each of the individual incidence rates (both low and high alternative values) had a sensitivity index of 1.00 for the category cost (the cost of educating only those students in the category). Again, this confirmed that costs changed in direct relationship to the number of students to be served. For example, Table 8.2 shows that a 28% increase in the number of speech students to be served caused a 28% increase in the projected costs for speech students.

The total cost sensitivity indices of the individual incidence rates, however, showed a wide variation from .02 to .19. These results meant that a given percentage change in the incidence rate for a single category caused only a fraction of that percentage change in the total costs. For example, the TMR category had a total cost sensitivity index of .10; this indicated that a doubling of the estimated incidence rate for TMR students (100% increase) would raise the total costs of special education by only 10%. These findings were also logical since the change in incidence rate for a single category affected only a fraction of the total handicapped student population. Since the sum of the individual incidence rates was equal to the total incidence rate and the sum of the costs of each category yielded the total cost, the sum of the total cost sensitivity indices for the individual categories was 1.00. The proportion of the total sensitivity index for each category reflected the proportion of the total cost represented by the costs of the category. Those categories with the greatest sensitivity indices were, therefore, EMR (.19), SLD (.19), and SED (.17). The speech category, which had the largest number of students, had a lower sensitivity index (.09) due to the lower costs of programs in which speech students were generally enrolled.

Resources and Prices

Sensitivity indices were calculated for the three types of resources used in the projections--personnel resources (teacher and aide salary and benefits), nonpersonnel resources (instructional materials, maintenance and operating costs, travel expense), and the average cost per student resource specification. The results are shown in Table 8.3.

For the personnel resources, the total cost sensitivity index was calculated using both the low and high alternative values for these variables. The personnel resource prices were varied plus and minus ten percent in the new projections and these changes resulted in a total cost sensitivity index of .70. This indicated that for every $100 salary increase, the total projected costs of special education would increase $70. This relationship reflected the fact that in the manner in which the

TABLE 8.3

SENSITIVITY ANALYSIS RESULTS--RESOURCES AND PRICES

Model Variable					1980 Costs ($000)				Sensitivity Analysis
Variable	Alt.	ML Value	Alt.Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Personnel Resources	Low	$12,628/ tchr	$11,365/ tchr	- 10.00%	Total	$5,026,752	$4,676,728	- 6.96%	.70
Personnel Resources	High	$12,628/ tchr	$13,890/ tchr	+ 10.00%	Total	$5,026,752	$5,376,627	+ 6.96%	.70
Non-personnel Resources	Low	$ 1,381/ unit	$ 687/ unit	- 50.25%	Total	$5,206,752	$4,849,804	- 3.52%	.07
Non-personnel Resources	High	$ 1,381/ unit	$ 2,392/ unit	+ 73.21%	Total	$5,026,752	$5,272,432	+ 4.89%	.07
Avg. Cost/ Student	Low	$ 9,318/ student	$ 7,120/ student	- 23.59%	Total	$5,026,752	$4,737,760	- 5.75%	.24
Avg. Cost/ Student	High	$ 9,318/ student	$12,560/ student	+ 34.79%	Total	$5,026,752	$5,453,474	+ 8.49%	.24
Avg. Cost/ Student-OADS	Low	$ 3,687/ student	$ 2,500/ student	- 32.19%	Program	$ 75,303	$ 51,060	- 32.19%	1.00
Avg. Cost/ Student-Resident	Low	$10,390/ student	$ 8,000/ student	- 23.00%	Program	$1,150,962	$ 886,208	- 23.00%	1.00
Avg. Cost/ Student-OADS	High	$ 3,687/ student	$ 5,000/ student	+ 35.61%	Program	$ 75,303	$ 102,120	+ 35.61%	1.00
Avg. Cost/ Student-Resident	High	$10,390/ student	$14,000/ student	+ 34.74%	Program	$1,150,962	$1,550,863	+ 34.74%	1.00

TABLE 8.3
(continued)

SENSITIVITY ANALYSIS RESULTS--RESOURCES AND PRICES

Model Variable					1980 Costs ($000)				Sensitivity Analysis
Variable	Alt.	ML Value	Alt.Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Avg. Cost/ Student-OADS	Low	$ 3,687/ student	$ 2,500/ student	- 32.19%	Total	$5,026,752	$5,002,509	- 0.48%	.01
Avg. Cost/ Student-Resident	Low	$10,390/ student	$ 8,000/ student	- 23.00%	Total	$5,026,752	$4,761,998	- 5.27%	.23
Avg. Cost/ Student-OADS	High	$ 3,687/ student	$ 5,000/ student	+ 35.61%	Total	$5,026,752	$5,053,569	+ 0.53%	.01
Avg. Cost/ Student-Resident	High	$10,390/ student	$14,000/ student	+ 34.74%	Total	$5,026,752	$5,426,653	+ 7.96%	.23

input cost factors were constructed, salary costs represented 70 percent of the total costs.

Similarly, total cost sensitivity indices were calculated for non-personnel resources and the average cost per student resources. The non-personnel resources (calculated as the weighted average cost per instructional unit of programs using these resources) had a total cost sensitivity index of .07, while the average cost per student resources had a total cost sensitivity index of .24. The total of these indices was 1.00 (with a slight rounding error), which would be expected since the three resources comprised all of the cost factors used in the data for the projections.

Program and total cost sensitivity indices were also calculated for the two types of programs which utilized the average cost per student resource--other agency day school and residential school. The residential school program, because of its greater number of students and higher cost, dominated the sensitivity index for the total cost (a .23 index for residential school and a .01 index for other agency day school). However, each of the program cost sensitivity indices was 1.00, indicating the direct relationship between the input cost level for the average cost per student resource and the total cost of the programs which used that resource as the sole cost factor.

Inflation Factor

Since the inflation factor used in the SEPM resource-cost model was applied only to the total special education costs, only the total cost sensitivity index was calculated for this variable. The results are shown in Table 8.4. The inflation factor had a total cost sensitivity index of .25. This represented the effect of the difference between the most likely inflation factor (6.77%) and the low (5.51%) and high (8.23%) alternative factors applied over four years. The inflation factor was the only variable in the analysis whose sensitivity index was time dependent. The relationship between the percentage change in the value of the variable (which remained constant) and the percentage change in the inflated costs (which was calculated using the expression $(1 + \text{inflation factor})^t$, where t = year beyond the base year) changed from year to year due to the compounding effect of the inflation factor. At three years the sensitivity index was lower and at five years it would have been greater.

Number of Students Per Unit

The number of students per unit values used in these sensitivity analyses represented the weighted average for each instructional program (total number of students of all categories served by a given program divided by the

TABLE 8.4

SENSITIVITY ANALYSIS RESULTS--INFLATION FACTOR

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Inflation Factor	Low	6.77%	5.51%	- 18.61%	Total	$6,532,549	$6,229,604	- 4.64%	.25
Inflation Factor	High	6.77%	8.23%	+ 21.57%	Total	$6,532,549	$6,897,258	+ 5.58%	.26

total number of teachers in the program). While the input data were originally specified in a category by program matrix, using a single average value for each program allowed the analyses to concentrate on the overall program variations and their cost effects, as well as permitting the calculation of a single percentage change for the input values. Further, the variable was specified as the number of students per unit (e.g., 22 EMR students per resource room unit), but the inverse of this value was actually used in the SEPM calculations (i.e., number of students ÷ number of students per unit = number of instructional units). Therefore, in calculating the percentage change for the value of the variables, the inverse of the specified most likely and alternative low and high values were used. This caused the apparent contradiction of an increase in the specified value for the number of students per unit being reflected as a negative change from the most likely value.

Three groups of sensitivity indices were calculated for this variable--the total cost sensitivity index for the overall average number of students per instructional program unit (all programs included), the program sensitivity indices for each individual program using this variable, and the total cost sensitivity indices for each individual program using this variable. The results are shown in Table 8.5.

TABLE 8.5

SENSITIVITY ANALYSIS RESULTS--NUMBER OF STUDENTS PER INSTRUCTIONAL UNIT

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
No. Students/ Unit	Low	Avg. = 23.96	Avg. = 30.84	- 22.31%	Total	$5,026,787	$4,182,777	- 16.79%	.75
No. Students/ Unit	High	Avg. = 23.96	Avg. = 16.90	+ 41.78%	Total	$5,026,787	$6,602,466	+ 31.35%	.75
No. Students/ Unit									
Ind Svc	Low	Avg. = 77.86	Avg. = 24.28	- 37.35%	Program	$ 40,441	$ 25,337	- 37.35%	1.00
S&L	"	= 66.81	= 82.75	- 19.26%	"	$ 453,586	$ 366,208	- 19.26%	1.00
ODS	"	= 25.24	= 33.34	- 24.30%	"	$ 183,862	$ 139,164	- 24.31%	1.00
Res Rm	"	= 22.79	= 30.55	- 25.40%	"	$1,044,021	$ 778,708	- 25.41%	1.00
Sp Class	"	= 11.30	= 14.14	- 20.08%	"	$1,989,801	$1,590,738	- 20.06%	1.00
Hosp/Hbd	"	= 7.78	= 12.27	- 36.59%	"	$ 88,811	$ 56,357	- 36.54%	1.00
No. Students/ Unit									
Ind Svc	High	Avg. = 77.86	Avg. = 32.92	+136.51%	Program	$ 40,441	$ 95,646	+136.53%	1.00
S&L	"	= 66.81	= 50.79	+ 31.54%	"	$ 453,586	$ 596,645	+ 31.54%	1.00
ODS	"	= 25.24	= 16.53	+ 52.69%	"	$ 183,862	$ 280,680	+ 52.66%	1.00
Res Rm	"	= 22.79	= 14.93	+ 52.65%	"	$1,044,021	$1,593,561	+ 52.64%	1.00
Sp Class	"	= 11.30	= 8.42	+ 34.20%	"	$1,989,801	$2,671,655	+ 34.27%	1.00
Hosp/Hbd	"	= 7.78	= 5.01	+ 55.29%	"	$ 88,811	$ 138,014	+ 55.40%	1.00

TABLE 8.5
(continued)

SENSITIVITY ANALYSIS RESULTS--NUMBER OF STUDENTS PER INSTRUCTIONAL UNIT

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt. Value	% Change	Type	ML Cost	Alt. Cost	% Change	
No. Students/ Unit		Avg.	Avg.						
Ind Svc	Low	= 77.86	= 124.28	- 37.35%	Total	$5,026,787	$5,011,683	- 0.30%	.01
S&L	"	= 66.81	= 82.75	- 19.26%	"	"	$4,939,409	- 1.74%	.09
ODS	"	= 25.24	= 33.34	- 24.30%	"	"	$4,982,089	- 0.89%	.04
Res Rm	"	= 22.79	= 30.55	- 25.40%	"	"	$4,761,474	- 5.28%	.21
Sp Class	"	= 11.30	= 14.14	- 20.08%	"	"	$4,627,724	- 7.94%	.40
Hosp/Hbd	"	= 7.78	= 12.27	- 36.59%	"	"	$4,994,333	- 0.65%	.02
No. Students/ Unit		Avg.	Avg.						
Ind Svc	High	= 77.86	= 32.92	+136.51%	Total	$5,026,787	$5,082,002	+ 1.10%	.01
S&L	"	= 66.81	= 50.79	+ 31.54%	"	"	$5,169,846	+ 2.85%	.09
ODS	"	= 25.24	= 16.53	+ 52.69%	"	"	$5,123,605	+ 1.93%	.04
Res Rm	"	= 22.79	= 14.93	+ 52.65%	"	"	$5,576,327	+10.93%	.21
Sp Class	"	= 11.30	= 8.42	+ 34.20%	"	"	$5,708,641	+13.56%	.40
Hosp/Hbd	"	= 7.78	= 5.01	+ 55.29%	"	"	$5,075,990	+ 0.98%	.02

The overall average number of students per unit value had a total cost sensitivity index of .75. This result was due to the fact that those programs which used this variable (indirect services, speech and language instruction, other direct services, resource room, special class, and hospital and homebound instruction) represented 75% of the total special education costs. Those using an average cost per student specification (other agency day school and residential school) represented the other 25% of the costs. However, as shown by the program sensitivity indices of 1.00 for each of the individual program costs, the resultant costs were directly dependent upon the value of the number of students per unit variable. In fact, had the cost base for the total cost sensitivity index calculation been the costs of only those programs using the number of students per unit variable, then the total sensitivity index would have been 1.00 also.

The total cost sensitivity indices for the individual programs showed great variability for the number of students per unit variable. Those programs with the greatest total cost sensitivity indices were the two primary instructional placements--special class with a total cost sensitivity index of .40 and resource room with a total cost sensitivity index of .21. This indicated that changes in the number of students per unit in these programs would have the greatest cost impact on special education. For example, if the average size of a special class were decreased from 12 to 8 students (a one-third drop in students per unit, but a 50% increase in the inverse of these values), then the total costs of special education would increase by 20% (.40 index x 50%). Again, the speech and language program, which had the largest number of students of any program, had a relatively low total cost sensitivity index (.09) due to the relatively low total cost of this program.

Use of instructional aides

The use of instructional aides was also tested for cost sensitivity. Three types of sensitivity indices were calculated for this variable--the total cost sensitivity index for the overall fraction of aides to teachers (in all programs), the program sensitivity indices for those programs which utilized aides, and the total cost sensitivity indices for those programs which utilized aides. The results are shown in Table 8.6. In the overall sensitivity analysis, the fraction of aides to the total number of teachers in all programs was used as the measure of the variable even though only two of the programs utilized aides. This resulted in a total cost sensitivity index of .07, which indicated that the use of aides had a relatively small impact on overall costs of special education (e.g., a doubling of the most likely

TABLE 8.6

SENSITIVITY ANALYSIS RESULTS--USE OF INSTRUCTIONAL AIDES

Model Variable					1980 Cost ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt.Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Aides-Overall	Low	.30 aide/teacher	.12 aide/teacher	- 60.00%	Total	$5,026,787	$4,813,303	- 4.25%	.07
Aides-Overall	High	.30 aide/teacher	.77 aide/teacher	+156.67%	Total	$5,026,787	$5,595,002	+ 11.30%	.07
Aides-Res Rm	Low	.30 aide/teacher	0.00 aide/teacher	-100.00%	Program	$1,044,021	$ 943,972	- 9.58%	.10
Aides-Sp Class	Low	.44 aide/teacher	.25 aide/teacher	- 43.18%	Program	$1,989,801	$1,876,366	- 5.70%	.13
Aides-Res Rm	High	.30 aide/teacher	1.00 aide/teacher	+233.33%	Total	$1,044,021	$1,277,627	+ 22.38%	.10
Aides-Sp Class	High	.44 aide/teacher	1.00 aide/teacher	+127.27%	Total	$1,989,801	$2,324,410	+ 16.82%	.13
Aides-Res Rm	Low	.30 aide/teacher	0.00 aide/teacher	-100.00%	Total	$5,026,787	$4,926,738	- 1.99%	.02
Aides-Sp Class	Low	.44 aide/teacher	.25 aide/teacher	- 43.18%	Total	$5,026,787	$4,913,352	- 2.26%	.05
Aides-Res Rm	High	.30 aide/teacher	1.00 aide/teacher	+233.33%	Total	$5,026,787	$5,260,393	+ 4.65%	.02
Aides-Sp Class	High	.44 aide/teacher	1.00 aide/teacher	+127.27%	Total	$5,026,787	$5,361,396	+ 6.66%	.05

use of aides would have caused only a 7% increase in total costs). Further analyses were conducted for the two programs that had aides in their resource specification--resource room and special class. The total cost sensitivity indices were .02 for resource room and .05 for special class; together they summed to the overall total cost sensitivity index for the use of instructional aides.

The program sensitivity indices for this variable were .10 for resource room and .13 for special class. Previously, the program sensitivity index for a variable had been 1.00, which indicated that the change in the value of the variable directly affected the full cost of the program. However, since aides comprised only a portion of the resources in these programs, changing the average quantity of an aide present did not affect the other resources or costs of the program. Consequently, the program sensitivity indices were less than 1.00. In fact, the proportion of the unit program costs which the aides represented were identical to the respective program sensitivity indices for these two programs.

Related Services

Four separate sensitivity analysis projections were developed for the related services costs; projections testing the effect of increases in prices and decreases in the number of students or service levels for both specific related services and nonspecific related services were produced. The results are shown in Table 8.7. Since the related service projections were initially calculated to be only indicative of the types of necessary activities in these areas, the analyses of these projections were not as extensive as those for instructional programs. The values of the price variable for each of the specific and nonspecific related services were increased 10% and new costs projected. The total cost sensitivity indices were .38 for the specific related services and .62 for the nonspecific related services. Similar total cost sensitivity indices were obtained by decreasing the values of the number of students for specific related services and the service level of nonspecific related services by 10%. These indices also represented the proportions of the total costs of related services of the specific and nonspecific related services. The program sensitivity indices for each of the related services were 1.00 in each case (with slight rounding errors) which indicated that the changes in the price, number of students, and service level variables directly affected the costs of the individual related services involved.

Cost Effects of Changes in Values of the Variables

In addition to determining the sensitivity indices, the sensitivity analysis projections were used to calcu-

TABLE 8.7

SENSITIVITY ANALYSIS RESULTS--RELATED SERVICES

Model Variable					1980 Costs ($000)				Sensitivity Index
Variable	Alt.	ML Value	Alt.Value	% Change	Type	ML Cost	Alt. Cost	% Change	
Specific Related Services									
-Price	High	ML Values	10% added	+10.00%	Total	$1,071,793	$1,112,368	+ 3.79%	.38
-Price	High	ML Values	10% added	+10.00%	Program	$ 407,967	$ 448,542	+ 9.95%	1.00
-Students	Low	815,179	733,776	- 9.99%	Total	$1,071,793	$1,031,320	- 3.78%	.38
-Students	Low	815,179	733,776	- 9.99%	Program	$ 407,967	$ 367,494	- 9.92%	.99
Nonspecific Related Services									
-Price	High	ML Values	10% added	+10.00%	Total	$1,071,793	$1,136,700	+ 6.06%	.61
-Price	High	ML Values	10% added	+10.00%	Program	$ 663,826	$ 728,733	+ 9.78%	.98
-Svc Level	Low	ML Values	10% reduc.	-10.00%	Total	$1,071,793	$1,005,638	- 6.17%	.62
-Svc Level	Low	ML Values	10% reduc.	-10.00%	Program	$ 663,826	$ 597,671	- 9.97%	1.00

late the dollar impact of changes from the most likely values of the variables to the low and high alternative values. By taking the difference between the most likely cost projections and the alternative cost projections based on the changed value of a single variable, the specific cost related to the change in the value of that variable was determined. The magnitude of the dollar cost change associated with a variable was dependent upon: 1) the degree of uncertainty surrounding the actual future value of that variable (as indicated by the percentage change of the alternative input values); and 2) the effect of the variable on the projected costs (as measured by the sensitivity index). Those variables with both a high percentage change in the alternative values and a high sensitivity index had the highest dollar cost changes. In fact, the product of the percentage change in the input value times the sensitivity index yielded the percentage cost change of the alternative projected cost from the most likely cost estimate.

The cost changes in the instructional programs which were attributable to substitution of the high and low alternative values for each variable are shown in Table 8.8. The largest cost differences were caused by changes in the incidence rate (low: -$1,142,520,000; high: $1,422,779,000) and in the number of students per unit (low: -$844,010,000; high: $1,575,679,000). Next in

TABLE 8.8

COSTS ASSOCIATED WITH CHANGES IN VALUES OF THE VARIABLES

Variable	Cost Changes (constant 1976-77 dollars, $000)			
	Low Alternative		High Alternative	
Total Population		$- 28,184		$ 35,574
Incidence Rate		- 1,142,520		1,422,779
- EMR	- 217,818		265,631	
- TMR	- 117,122		143,224	
- Hearing	- 69,645		92,830	
- Speech	- 102,118		125,554	
- Vision	- 20,495		20,474	
- SED	- 194,493		240,819	
- Ortho	- 40,023		48,010	
- OHI	- 81,755		112,437	
- SLD	- 218,460		273,026	
- Multiple	- 80,585		100,779	
Personnel Resources		- 350,024		349,875
Non-Personnel Resources		- 176,948		245,680
Average Cost/ Student		- 288,992		426,722
- OADS	- 24,243		26,817	
- Residential	- 264,754		399,901	
Expected Placement		- 481,234		563,325

TABLE 8.8
(continued)

COSTS ASSOCIATED WITH CHANGES IN VALUES OF THE VARIABLES

Variable	Cost Changes (constant 1976-77 dollars, $000)			
	Low Alternative		High Alternative	
No. Students/ Unit		- 844,010		1,575,679
- Indirect Svcs	- 15,104		55,215	
- S&L Inst	- 87,378		143,059	
- Other Dir Svcs	- 44,698		96,818	
- Resource Room	- 265,313		549,540	
- Special Class	- 399,063		681,354	
- Hosp & Home	- 32,454		49,203	
Use of Aides		- 213,484		568,215
- Resource Room	- 100,049		233,606	
- Special Class	- 113,435		334,609	
Total (constant 1976-77 $)		$-3,525,396		$5,187,849
Inflation Factor		- 302,945		364,709
Total (Inflated Dollars)		$-3,828,341		$5,552,558

importance were changes in the expected placement pattern, use of aides, the average cost per student (in residential programs primarily), personnel resources, inflation factor, and non-personnel resources. The changes in the estimates of the total student population had only a minor impact on the total cost changes.

The cost changes associated with the high alternative were generally, and sometimes considerably, larger than those of the low alternative. This reflected the asymetrical nature of the alternative input values around the most likely value for the variables--the high alternative values showed greater differences from the most likely values than did the low alternative values. For example, for the number of students per unit variable, where the high alternative cost change was almost double the low alternative cost change, the percentage change of the high alternative input value from the most likely value was 42%, while the low alternative input value percentage change was 22%. These greater percentage changes in the high alternative values of the variables indicated the relatively larger degree of uncertainty associated with the high alternative values by the sample group of states.

The sums of the cost changes attributable to the low and high values of each individual variable (totals from Table 8.8) were also compared to the differences between the most likely cost projections and the low and high alternative cost projections, respectively. The sum of the individual cost changes did not equal, even approximately, the cost differences between the most likely cost projections and either the low or high alternative projections. The comparisons for the low and high alternatives are shown in Table 8.9. For the constant 1976-77 dollar costs, the difference between the most likely and low alternative cost projections in 1980-81 was $2.862 billion, while the sum of the individual cost changes (also in constant 1976-77 dollars) using the low values one at a time totaled $3.525 billion, or $663 million greater. The direction of the variance was reversed in the most likely to high alternative comparison where the difference between the two projections in 1980-81 was $8.715 billion in constant 1976-77 dollars and the sum of the individual cost changes using the high values singly was $5.188 billion (also in constant 1976-77 dollars), or $3.527 billion less. For the inflation amounts, the cost change due to the difference in the inflation factor alone was well below the differences between the most likely projections and either of the alternative projections. The total differences represented the net amount of the constant dollar and inflated dollar calculations.

The reason for these large differences lay in the

TABLE 8.9

COMPARISON OF COST CHANGES

Cost Comparison ($000)	Low Alternative	High Alternative
Constant 1976-77 Dollar Costs		
Most Likely Total Costs	$ 5,026,752	$ 5,026,752
Alternative Total Costs	2,164,444	13,742,186
Difference Between Projections	$ 2,862,308	$ 8,715,434
Sum of Individual Variable Cost Changes	$ 3,525,396	$ 5,187,849
Difference	$ - 663,088	$ 3,527,585
Inflated Dollar Costs		
Most Likely Inflation Amount	$ 1,505,797	$ 1,505,797
Alternative Inflation Amount	517,930	5,113,606
Difference Between Projections	$ 987,867	$ 3,607,809
Inflation Factor Cost Change	$ 302,945	$ 364,709
Difference	$ 684,922	$ 3,243,100
Total Costs (Inflated Dollars)		
Most Likely Total Costs	$ 6,532,549	$ 6,532,549
Alternative Total Costs	2,682,374	18,855,792
Difference Between Projections	$ 3,850,175	$ 12,323,243
Sum of Individual Variable Cost Changes	$ 3,828,341	$ 5,552,558
Difference	$ 21,834	$ 6,770,685

different relationships of the changed values of the variables in the low and high alternative projections and the projections developed for the sensitivity analyses. In the low and high alternative projections, all of the values of the variables were changed simultaneously and the changed values interacted in the calculations with each other. For example, in the high alternative, the high value for the total population was used together with the higher incidence rate and the higher use of resources and prices and the lower values for number of students per unit. The compounding of the changed values of the variables caused by the chain multiplication of the variables utilized in SEPM produced much higher costs in the high alternative projections because the cost changes included both those caused by the individual variable changes and also those caused by the interaction among the changed values of the variables. In this same fashion, the low alternative values interacted with each other to reduce their combined effect to less than that of the sum of the individual changes.

In contrast, in the sensitivity analysis projections only a single variable was changed at a time and this changed value interacted with the most likely values of the other variables. The cost changes produced in these projections represented only the effects of a single variable; no interaction effects were included.

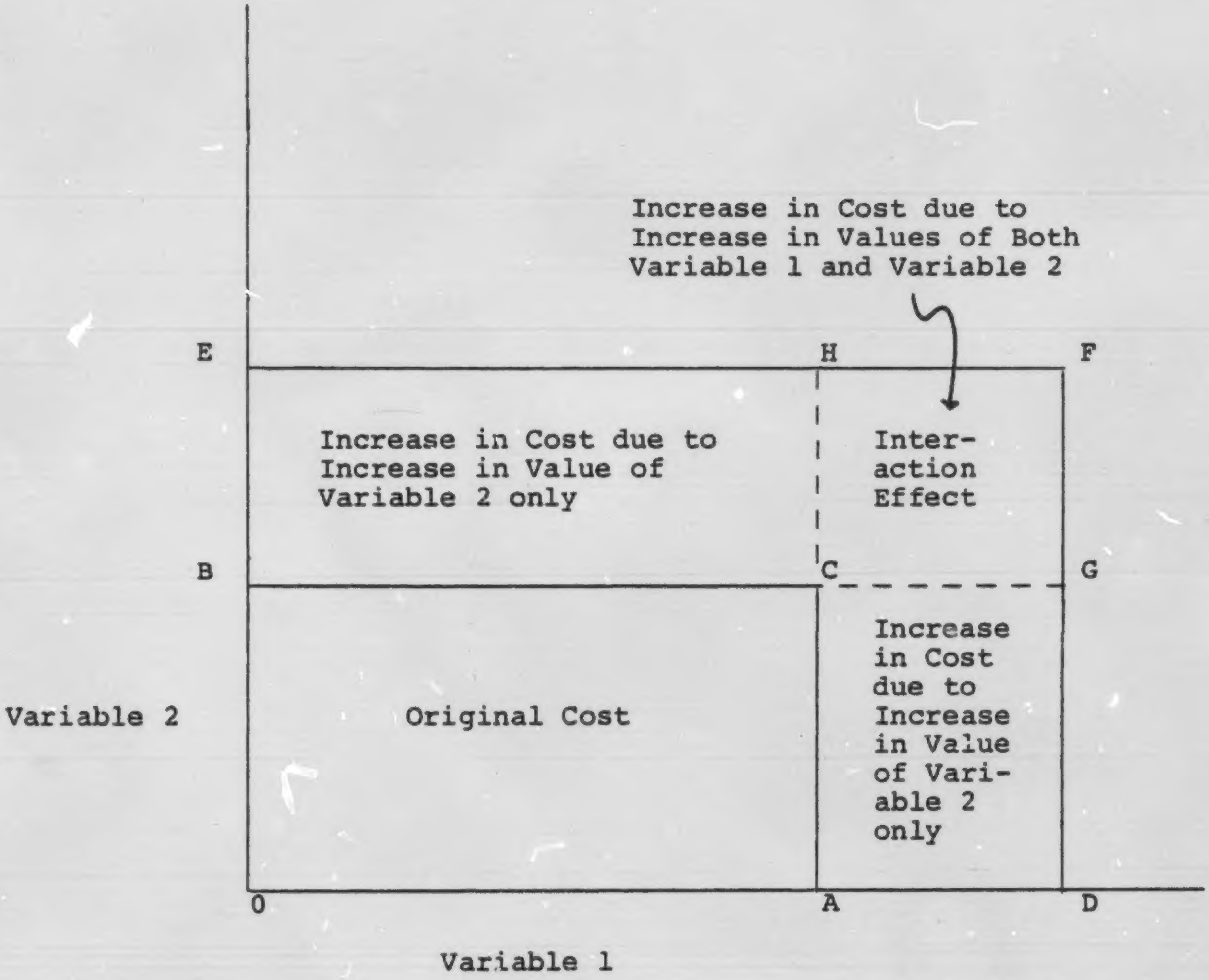
The diagram in Figure 8.1 illustrates graphically the concepts of the single variable and interaction effects in two dimensions. The original product of the two variables is represented by the rectangle OACB; this is analogous to the most likely cost projections. The values of the variables are increased from A to D and from B to E respectively. These new values are analogous to the high alternative values. The new product of the higher values is represented by ODFE. This is analogous to the high alternative cost projections. The difference between the original product and the new higher product is made up of three components: the increase in area due to the increase in the value of variable 1 only (ADGC); the increase in area due to the increase in the value of variable 2 only (BCHE); and the increase in area due to the increase in the values of both variable 1 and variable 2 working together--the interaction effect (CGHF).

The cost changes for the related services are shown in the chart below. Since the selection of the re-

Related Services and Variables	Cost Changes (constant 1976-77 dollars, $000)	
	Low Alternative	High Alternative
Specific		
Price	NA	$40,575
Students	$40,473	NA
Nonspecific		
Price	NA	$64,907
Service Level	$66,155	NA

FIGURE 8.1

ILLUSTRATION OF SINGLE VARIABLE AND INTERACTION EFFECTS


Increase in Cost due to Increase in Values of Both Variable 1 and Variable 2
E
H
F
Increase in Cost due to Increase in Value of Variable 2 only
Inter-action Effect
B
C
G
Variable 2
Original Cost
Increase in Cost due to Increase in Value of Vari-able 2 only
0
A
D
Variable 1

lated services together with the level of change of the values of the variables for these services was arbitrary, the results were only illustrative of the process involved. For both the specific and nonspecific related services the dollar amount of the cost changes represented approximately ten percent of the total costs of each service.

To summarize the investigations in this chapter, a sensitivity analysis was conducted for each variable in the SEPM resource-cost model and sensitivity indices were developed. These indices showed the degree to which changes in the input value of each variable affected the cost projections for special education. Additionally, the dollar cost effects of changing the input values from the most likely to the low and high alternative values were calculated. The results indicated that the variables which had the most impact on the future cost estimates were the assumed incidence rates for handicapping conditions and the number of students per instructional program. The wide range of estimated future costs could be significantly narrowed with improved data for these variables. Other variables, such as the expected placement pattern of students in instructional programs, use of instructional aides, average cost per student in residential programs, use of and prices for personnel and non-personnel resources, and the assumed inflation factor, were also important and had cost effects ranging in the hundreds of millions of dollars. The effects of the results on special education policy decisions and their implications for future research in this area are discussed in the next chapter.

CHAPTER IX

CONCLUSIONS

Recent political and legal mandates have firmly established the educational rights of all handicapped children. In the last decade, new laws enacted in forty-eight states and a series of favorable court rulings have been instrumental in creating a broad legal base for the education of handicapped children. At the federal level, P.L. 94-142, the "Education for All Handicapped Children Act" of 1975, has set as a national policy that all handicapped children are to receive a free, appropriate public education by 1980. Even with a history of over one hundred years of special education in the United States, estimates from professionals in the field suggest that there is a large population of handicapped children who are still without any services or are not receiving an appropriate educational program. Estimtes of this population range from a fifty to one hundred percent increase in the number of handicapped students presently being served.

What will it cost to meet these mandates and to provide all handicapped children with an education appropriate to their needs? The answer is that "it depends." Specifically, it depends upon a variety of interrelated programmatic decisions, policies, procedures, and changes which are presently underway and will be continuing in the future. The future costs of special education will be a function of the future programmatic outcomes which are currently evolving.

Among the many programmatic changes which are occurring or expected to occur are: handicapped children being served in the least restrictive environment, including a substantial use of regular education programs; great increases occurring in the number of mildly handicapped students in special education; educational services being provided to severely handicapped children who were previously excluded; new types of instructional programs being more widely available; additional special education services going beyond instruction--identification, assessment and instructional planning, highly specialized materials and equipment, and specialized therapy; and a greater individualizing of instruction based on the specific educational needs of each handicapped student.

While general program trends may be discernable, the specific forms that they may take remain uncertain. And it is these specific outcomes which will determine what the costs of special education will be. For example, it is not sufficient to know that more mildly handicapped students will be served in mainstream programs in the future. To estimate the costs of serving these students requires much more specific information: How many more mildly handicapped students will there be? What types of programs will they be assigned to? What types and quantities of resources will be required in these programs? What will be the prices of the necessary resources? How many students can be served by each teacher in a program?

These types of questions concerning specific programmatic outcomes cannot be answered with certainty for the future as they represent decisions and choices yet to be made and events yet to occur. Although they can, and indeed, must be estimated in order to develop future cost projections, the range of uncertainty in the assumptions about the future can have a significant impact on cost estimates. This uncertainty about the future, which in special education is substantial, presents a serious problem for estimating its costs with reliability.

The task of estimating the costs of special education is further complicated by the great diversification in methods of identifying handicapped children and assessing their educational needs and the wide variety of instructional approaches employed by educational agencies. While specific approaches have proven effective for a given group of handicapped students in a particular location, the enormous variability in the types and severity of handicapping conditions, the organizational settings, and the geographic and demographic situations encountered by special education makes it difficult to generalize about handicapped students and programs appropriate for their education. At the national level, there are no clear and consistent standards for determining the population to receive special education services, the appropriate programs and services for various handicapped students, or what the programs and services themselves consist of. Adequate scientific data are not currently available to resolve these questions.

Federal and state laws and regulations govern the local provision of special education programs; they provide a framework for, give direction to, and set constraints upon school district activities. However, special education statutes vary from state to state and state laws are not always consistent with federal provisions. Further, even where the laws and regulations are generally consistent, there remains significant leeway at the local level in the interpretation and implementation of such areas as eligibility and placement decisions for individual students, specific programs and services provided, and the composition of those programs and services to have a substantial impact on costs. Cost estimation procedures cannot resolve the problem of variability of the actual practices in special education, but they must at least deal with this issue and ideally make explicit the potential impact on costs of the divergences in programs and practices.

The purpose of this study has been to estimate the costs of providing all school aged handicapped children in the United States with an appropriate education in

1980-81. Three main objectives were established for a suitable cost estimation methodology. First, it was necessary that the programmatic aspects of special education--student and program characteristics and their relationships, as well as the educational decisions and policies involved in special education--formed the basis of the cost estimation procedures. Next, the widespread variation in actual program practices and the unavailability of accepted standards to guide national projections had to be dealt with adequately. Finally, future program practices in special education had to be incorporated into the approach and the cost impact of the uncertainty surrounding their occurrence made explicit.

Previous special education cost studies and their methodologies did not meet these objectives. In general, their major faults were: the actual program practices were either obscured or unidentified in the methodological procedures; past program practices and costs were extrapolated to project future costs; use of aggregated average per student costs (the most common approach) hid large cost variations in actual practice; and neither future changes in special education nor the uncertainty associated with their happening were recognized.

The Resource-Cost Model Approach

To meet the cost estimation objectives and to overcome the difficulties of previous studies, a resource-cost model approach was used. In this approach, a mathematical formulation was developed of the relationships among students, programs, resources, and decision rules involved in the special education process. The students to be served and the instructional programs which were to be utilized were specified along with the resources used in each program (e.g., teacher, aide, instructional materials and supplies, and maintenance and operating expenses). Prices were assigned to each resource and costs were estimated based on the values of the programmatic and price variables used in the model.

A particular resource-cost model of the special education process, the Special Education Planning Model (SEPM), was used to develop the cost estimates in this study. Two types of data were required for operation of the model: decision variables and planning variables. The values for the decision variables represented programmatic decisions, choices, judgements, and assumptions about the special education process made by educational decision makers or planners. These variables ranged from broad policy decisions to specific operating rules (e.g., handicapping conditions to be served by special education, estimated incidence rates of handicapping conditions, programs and services to be provided, use of resources within each program and service, allocation of handicapped students to programs, number of students per unit of each instructional program). The planning variables, although out of the control or influence of the decision makers, affected both the special education programs and their costs, and values for these variables were also established. Examples of planning variables in SEPM were the total school age enrollment and the inflation rate. For both types of variables, data concerning the present situation and the expected future conditions were required by the model.

The resource-cost model approach offered a number of important advantages for estimating the costs of special education.

1. The approach concentrated on the educational and programmatic relationships and decisions which were involved in special education. It then translated these programmatic aspects into costs.

2. The approach explicitly identified and specified the educational programs for which costs were to be estimated. The educational process was not hidden in the calculations.

3. The aspects of the educational process which were relevant to special education were included (e.g., instructional programs) and those not relevant were excluded (e.g., district administration).

4. The approach proved highly flexible. Many different educational situations, handicapping conditions, types of programs, and types of costs were

accommodated in the resource-cost model.

5. The focus of the cost estimation and associated analytical efforts were controlled by the objective of the study, not by the availability of cost accounting data.

6. The approach was oriented toward the future. Cost estimates were based on expectations about future programs rather than historical practices and costs.

7. The use of a model permitted an analytical testing of the cost impact of varying the assumptions concerning the key elements of the special education process and their relationships. In this fashion, it was possible to estimate the cost changes caused by a wide range of future conditions and possible program practices. While not resolving the uncertainty inherent in the future of special education, this procedure was able to develop a range of possible cost levels under various circumstances.

One additional aspect of the resource-cost model approach, critical to policy analysis, should be noted. Through the use of a model, it is possible to evaluate the cost impact of tradeoffs among alternative educational proposals. By providing information about the expected costs of each proposal, the resource-cost model methodology can assist decision makers in setting priorities among various competing proposals and in allocating limited funds among them. If several proposals are aimed at achieving the same objective(s), a comparison of the relative costs of each proposal can aid in selecting the most cost-efficient alternative.

There were, however, several limitations or problems with the resource-cost model approach which were encountered during the course of the study. Some of the data required by the model were not routinely collected or available in school systems. This was particularly true with data presented by type of instructional program (i.e., specific resources in each program, allocation of handicapped students to each program, and actual number of students per each instructional unit). In these cases, it was necessary to calculate or estimate the required values from data that were available. There was a related lack of data on which to make estimates of future special education conditions. In estimating the future, there was an inevitable reliance on professional judgments of special educators. The resultant estimates depended, in large part, on their abilities--from a simple extrapolation of the current situation to a thorough analysis of future programmatic trends. The focus on the future and the lack of firm data about future conditions also subjected the approach to bias or manipulation through the estimation of the expected situation. This was an inherent shortcoming, but one that was countered by making the assumptions about the future explicit and open to challenge.

National Cost Estimates

Data from twenty-six states which had used the SEPM resource-cost model to develop their own state special education cost estimates were used to generate estimates of the total costs of providing an appropriate education to all school aged handicapped children in the United States from 1976-77 to 1980-81. The sample of states presented a wide spectrum of population, geographic, and demographic characteristics, as well as special education approaches and programming practices. From the input data prepared by each state, information required by the model concerning both the current programming practices and the characteristics of the handicapped population served by each state were obtained along with their expectations for the future for their special education programs. Using the most likely values of the model variables which were based on averages of the states' input data, national projections were developed which represented the most likely estimates of future special education costs.

Projections from the SEPM resource-cost model indicated that the most likely estimate of special education instructional costs in 1980-81 was $6,533 billion (including the effects of inflation at 6.77% annually from 1976-77). This estimate included the costs of instructional programs for all school aged handicapped children. Excluded from this estimate were the regular education costs incurred by handicapped students receiving portions of their education in regular classrooms and costs for pre and postschool aged handicapped students. Further, the estimate was not an excess cost because the equivalent costs of regular education were not deducted from the cost estimates of special education programs involving separate instruction. Nevertheless, this estimate represented the total special education program cost, which was considered by this study to reflect the most meaningful and useful type of cost projection.

In addition to the most likely estimate, alternative low and high projections were developed to indicate the range of possible costs under consistently low or high assumptions, respectively, about the future. These alternative projections also provided an indication of the uncertainty associated with the projected future costs of special education. The results yielded an extremely wide range of possible instructional costs in 1980-81, from a lower limit of $2.682 billion (inflated) to an upper limit of $18.856 billion (inflated). These extremes indicated the importance and critical nature of the programmatic decisions and assumptions which underlay the cost estimates.

Estimates were also developed for the costs of certain related services for special education students (e.g., special transportation, physical and occupational therapy, identification and assessment activities, local administration, and inservice training for teachers). These estimates were developed using a very narrow data base from the limited number of states in the sample which projected related services. As a result, the estimates were much less reliable than those for instructional programs. However, they were calculated in order to apply the resource-cost model methodology to this cost category and to provide a very general estimate of the possible costs. The most likely costs for related services in 1980-81 was $1.393 billion, with the low alternative estimate of $1.211 billion and the high alternative estimate of $1.632 billion (all in inflated dollars). The range of possible costs in this area was not great, particularly in comparison with the range of possible costs projected for instructional programs. The reason was that the bulk of these costs (educational assessment, local administration, inservice training) were treated as essentially fixed costs with only a relatively small price variation as the major difference between the most likely estimate and the low and high alternative estimates.

The results are summarized in Table 9.1 for the three different cost estimates. Since the related services

TABLE 9.1

ESTIMATES OF NATIONAL SPECIAL EDUCATION COSTS IN 1980-81 FOR SCHOOL AGED HANDICAPPED STUDENTS

(dollars in billions and inflated at 6.77% from 1976-77)

Type of Cost	Most Likely Estimate	Low Alternative	High Alternative
Instructional Programs	$6.533	$2.682	$18.856
Related Services	$1.393	$1.211	$ 1.632
Total	$7.926	$3.893	$20.488

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estimates were incomplete, the most likely estimate of the costs of special education for school aged handicapped children in 1980-81 should reach at least $8.0 billion (inflated dollars). As a point of reference, the comparable reported federal, state, and local costs for special education in 1976-77 were $4.485 billion.

To test the impact on the total cost estimates of each variable in the model, a series of sensitivity analyses were conducted. With the most likely estimates as the base case, the low and then high values for one variable at a time were substituted and new projections developed. The impact on costs of each variable was measured in two ways--the dollar amount of the resultant change and a sensitivity index (the ratio of the percentage change in costs to the percentage change in the value of the model variable). The most important variables in terms of these two measures were the incidence rates assumed for handicapping conditions and the number of students per unit of an instructional program. Other variables of importance were the expected program placements of handicapped students, use of instructional aides, the average cost per student in residential programs, use of personnel and nonpersonnel resources, prices for these resources, and the inflation rate.

Policy Implications

The most likely cost estimates indicate that a significant increase in funding is necessary to serve all school aged handicapped children in an educationally appropriate manner and to meet the federal and state legislative and judicial mandates. Based on the estimated funding in 1976-77 of $4.485 billion ($4.076 billion from state and local sources and $0.409 billion from federal sources), it would require an additional $3.441 billion to meet the costs of serving all school aged handicapped students in 1980-81, an increase of 77 percent over 1976-77. However, the necessary cost increases of special education in 1980-81 may well be even higher with a more complete utilization of related services than shown in these estimates. A greater cost impact will be the additional costs of serving handicapped children in the pre and postschool age groups which will push the total costs of special education even higher. Therefore, given the programmatic assumptions on which the most likely estimates are based, a minimum of an additional $3.4 billion will be necessary by 1980-81 if the full service goals of special education are to be reached. If complete implementation is delayed beyond this date, the costs would increase further due to inflation.

From what sources will this large increase in funding come--local, state, federal--and what will be the impact on the relative share of the funds provided by each? The relative proportions of the future special education costs supported by different levels of government depend upon future legislative actions which cannot be predicted with reliable accuracy; there are too many unknowns, contingencies, and outside influences involved. To show the range of possible outcomes, Table 9.2 illustrates three different alternatives under differing assumptions. At one end of the range. P.L. 94-142 would be fully funded to its authorization level of $3.16 billion. The large federal increase would cover practically all of the increased funding requirements and the federal share would rise to 44 percent from its 1976-77 share of 9 percent. At the other end of the range, the funding proportions would remain as they were in 1976-77. In this event, state and local sources would be required to fund an additional $3.1 billion. The middle alternative would be one in which the additional costs would be shared equally, with the local and state sources and the federal sources each funding an additional $1.7 billion. This would shift the state and local share to 73 percent and the federal share to 27 percent.

There have already been important shifts in program and fiscal control away from the local level to the state and federal levels. This has occurred through new laws and guidelines specifying programmatic requirements, regulations obligating local districts to meet state and federal standards in order to receive funds, and the earmarking of certain funds for specific state and federal

TABLE 9.2

ALTERNATIVE PROPORTIONS OF SPECIAL EDUCATION FUNDING BY GOVERNMENTAL LEVEL

Alternative 1: Full Funding of P.L. 94-142

Governmental Level	Current		Addition	Future	
	$ billion	%	$ billion	$ billion	%
Local & State	$4.1	91%	$0.3	$4.4	56%
Federal	0.4	9%	3.1	3.5	44%
Total	$4.5	100%	$3.4	$7.9	100%

Alternative 2: Maintain Present Proportions

Governmental Level	Current		Addition	Future	
	$ billion	%	$ billion	$ billion	%
Local & State	$4.1	91%	$3.1	$7.2	91%
Federal	0.4	9%	0.3	0.7	9%
Total	$4.5	100%	$3.4	$7.9	100%

Alternative 3: Equal Contribution for Additional Amount

Governmental Level	Current		Addition	Future	
	$ billion	%	$ billion	$ billion	%
Local & State	$4.1	91%	$1.7	$5.8	73%
Federal	0.4	9%	1.7	2.1	27%
Total	$4.5	100%	$3.4	$7.9	100%

priorities. With a larger federal share of funding, as can be expected under P.L. 94-142, a greater degree of federal involvement in programmatic decisions can also be expected. In this situation of increasing federal influence and control it is important to reach a balance between the federal (and state) agencies' tasks of carrying out their legislated duties and the local districts' needs for sufficient flexibility in actual program implementation to allow them to meet their individual circumstances. The situations found in different districts are too varied to establish a single national (or even state) set of detailed program standards to which all must conform.

As shown by the wide variation between the low and high alternative cost estimates, there is a great deal of uncertainty concerning what the future costs of special education will actually be. The reasons for the variations among the most likely, low and high estimates stem from differences in the programmatic assumptions which went into each estimate. Many of the areas of uncertainty are in decisions variables over which educational decision makers have some control or influence (e.g., broad or narrow definition of handicapping conditions, resources utilized by various programs, placement of handicapped students in various instructional programs and related services, and numbers of students per unit of instructional programs). The level of costs will be influenced by the choice of programming practices and policy decisions actually adopted in the future. The uncertainty surrounding future costs will also be reduced as more of the policy and programming decisions are established. The degree of control will probably be greatest at the local level where the operating decisions are made; however, program standards and regulations promulgated at the state and federal levels can limit or direct local actions and provide the state and federal levels a means of controlling and/or influencing special education costs.

Tradeoffs among different program practices offer possibilities to balance cost changes without sacrificing perceived program quality. Changes which increase costs can be counterbalanced by other changes which would reduce costs. As an example, a greater use of instructional aides (cost increase) in certain programs could be combined with higher numbers of students per unit (cost reduction) in those programs. The cost implications of these two connected moves are illustrated in Table 9.3. Two programs which have aides, resource room and special class, increase the use of aides from part-time to full-time in each program, while at the same time the number of students served by one unit of each program is also increased. The changes in the example represent a shift from the most likely program conditions to those of the high alternative for use of aides and the low alternative

TABLE 9.3

EXAMPLE OF COST TRADEOFFS BETWEEN PROGRAM CHANGES: GREATER USE OF INSTRUCTIONAL AIDES AND HIGHER STUDENTS PER UNIT IN TWO PROGRAMS

Program	Aides/Unit			Students/Unit			Interaction Effect ($ million)	Net Cost Difference ($ million)
	Most Likely	High Alternative	Cost Difference ($ million)	Most Likely	Low Alternative	Cost Difference ($ million)		
Resource Room	0.30	1.00	$234	23	31	($265)	($ 60)	($ 91)
Special Class	0.40	1.00	$335	11	14	($399)	($ 68)	($132)
Total			$569			($664)	($128)	($223)

for students per unit. Under these example conditions, the increase in aides alone would represent an additional cost nationally of $569 million, the higher number of students per unit alone would reduce the costs by $664 million, and the interaction effect of the two variables working on each other would cause a reduction of $128 million. The result would be a net cost reduction of $223 million for this example.

Another type of tradeoff deals with establishing priorities among competing program proposals to meet budgetary limitations. By focusing on the programmatic aspects of the proposals and using the resource-cost model to translate program considerations into costs, this approach provides essential information to decision makers for choosing among different proposals and for making compromises among them. For example, would it be more important to lower the number of students per unit in special classes by an average of three students per class or to provide supplemental speech and language instruction to students in those classes? Both may be worthy objectives, but budget limitations may not permit both proposals. Analysis of such proposals through a resource-cost model will not answer the question of which proposal is more important, but it will provide an estimate of the costs of each proposal to aid in the decision. Further analysis can be conducted to determine programmatic compromises which could be made to achieve a portion of the objectives of each proposal and still remain within budget requirements. In the example above, this could mean lowering the average class size in special classes by one instead of three and providing speech and language instruction to only half of these students. In any such tradeoff analyses, however, care should be taken not to allow cost considerations to override good programming practices.

The role of special education versus regular education for mildly handicapped students is another issue of potential importance in considering special education costs. The pressures on educational budgets from enrollment declines and taxpayer revolts combined with an increase in federal funds for special education could lead to a broader definition of special education in order to include more mildly handicapped and perhaps even some students previously served in regular education programs, such as remedial studies. With tighter regular education budgets, it may be thought preferable to provide some regular education students with services through special education (with the possible stigmatization of these students by labeling them as handicapped, but, therefore, eligible to receive special education services), than to be unable to provide them with any special assistance through an austere regular education program. The availability of funds for special education could also result in a takeover by special education of certain regular education services, such as social work, guidance and counseling, health, psychological testing, and educational media. In any event, the potential magnitude of future special education funds, particularly from P.L. 94-142, represents a possible opportunity for significant cost shifts from regular education to special education within the overall education budget.

The influx to school districts of large amounts of federal funds for special education may be at odds with other efforts at school finance reform and financial equity. However, special education involves a different concept of equity. Equal dollar per student expenditures mean unequal treatment for handicapped students. The attainment of equal educational opportunity for handicapped students means more services, resources, and costs. This is the definition of special education. These categorical funds have a different purpose than regular education funds and cannot be measured by the same equity yardstick.

Of necessity, the national cost estimates developed in this study were based on an average, aggregated analysis which assumed a homogeneous distribution of both non-handicapped and handicapped students across the nation. However, when utilizing the resource-cost model at lower levels of aggregation, such as a district or a region within a state, the effects of uneven geographic distribution of handicapped children necessitate special treatment in at least two areas--low population density rural programs and inner city population concentrations. In sparsely populated regions there may be insufficient numbers of children with certain low incidence handicapping conditions (e.g., blindness, deafness) to support an appropriate program. In these cases, the analysis should include alternative program placements for these students, such as regionalized programs or state schools. In inner city programs national incidence rates may provide too low an estimate of the population in need of special education services and the mix of programs provided may need to be modified as well. In both cases, the resource-cost model approach can be used to encourage and examine flexibility in programming to provide adequate educational services to handicapped students in an efficient manner.

Future Research Directions

In the course of this study a number of issues were encountered which are in need of further investigation. They range from theoretical considerations to improved empirical data to more accurate knowledge of actual practices. Further research on these suggested topics should lead to refinements and improvements in both the process and the results of special education cost estimation.

The first and most obvious need for improved information is in the areas where a combination of inadequate data (i.e., highly uncertain and/or irregular) and high cost impact existed. The definitions of handicapping conditions and special education needs must be better articulated. A handicapping condition may be a convenient label, but often can tell little about the educational needs of and the appropriate programs for the children so labeled. Tied with this must be a better estimate of incidence rates to project the numbers of children expected to be served by special education. These estimates should not be just of the occurrence of the handicapping conditions, but more importantly provide a reliable indication of the numbers of children needing various types of special education programs and services. The specification of handicapping conditions, special education needs, and incidence rates would be a major research effort involving a large scale national survey of currently identified handicapped students, a means of estimating the number of unidentified handicapped children eligible for or in need of special education, a thorough diagnostic evaluation of a representative stratified sample of these students, a linking of the handicapping conditions and special education needs, and the establishment of generally applicable definitions and procedures which could be used consistently by local, state, and federal agencies.

Better and more reliable data on the effectiveness of alternative program practices is also an important need. Research is this area would include both a more accurate determination of actual practices as well as theoretical investigations upon which improvements in practice can be based. A primary subject for a more thorough investigation is the use of resources in the various special education programs. Studies in this area should survey the actual use of resources by type of program (and handicapping condition, if appropriate) to document current practices. Also, analyses of alternative uses or resources and their impact on program effectiveness and costs should be undertaken. Improved information is required on the effectiveness of various programming patterns for different handicapped students. Research in this area should deal with the question of defining and documenting an "appropriate" education for various types and severities of handicapped students. To be useful for educational programming, planning, and cost estimation, such specification should be in terms of programs, services, and resources, as well as curriculum content. The third area for study is the effectiveness of various numbers of students per unit in special education programs. Do lower or higher number of students per unit make a significant difference in the results achieved by students? Under what circumstances? In all three of these types of studies, surveys of typical, average practices as well as exemplary programs should be undertaken. Further, they will all have to deal with the difficult issues of defining and measuring effectiveenss of student outcomes.

The area of related services is not sufficiently understood. Adequate information on which to develop reliable cost projections was not available from the sample group of states and the initial projections in this study were primarily illustrative. A thorough study of this area using the resource-cost model approach would include: the determination of a comprehensive set of related services; the specification of the resources comprising each related service; an investigation of the needs of various types of handicapped students for the different related services; the proportions of these students needing various related services; the duration for which the related services are needed; and, finally, a more complete cost estimate for related services based on these new data.

The recent legislative and judicial actions have placed many new requirements on local education agencies. These requirements affect program practices which, in turn, affect the costs of special education. For example: Have the new laws and legal decisions resulted in more students being served in special education? Which types of students are being added? What programs and services are being emphasized? What is involved in terms of resources (e.g., instructional and administrative time, supplies, travel, legal and other professional services) to comply with newly mandated procedures such as an individual educational program for every handicapped student, the due process requirements, and development of local planning documents? An examination of what actual changes are occurring and how costs are altered is essential if further cost projections are to reflect accurately the important programmatic trends in special education.

How the economies of scale affect special education costs, particularly at the local and regional levels is another research topic of interest. To investigate this question it will be necessary to examine the alternatives of regionalization versus district provision of service for low incidence handicapping conditions. Among the tradeoffs to be considered are higher student/personnel ratios possible through regional programs and the resultant lower cost per student for instruction with the increased transportation and possibly residential costs which would also be required for a centralized program. Such investigations should also consider the effects on students under each alternative--long daily bus rides or living away from home versus staying at home and attending community schools.

With the potential changes in program practices for handicapped students, there are possibilities of cost shifts within the educational budget between special education and regular education. Such shifts can go in both directions. What will be the cost impacts of such practices as: greater use of regular education programs for many mildly handicapped students; reduced class sizes in regular classrooms to accommodate handicapped students; and special education assumption of certain regular education programs and services? With possible large scale changes in program practices in the future, the magnitude of the cost shifts involved could become significant.

Based on the results of the investigations suggested above, a more precise modeling of the special education process could be undertaken. Examples of possibilities for improvement (which are contingent upon available and reliable data) are: separation of projections into elementary and secondary age groups to treat differences in incidence rates, special education needs, appropriate programs and services, types and quantities of resources required, and organizational arrangements; and inclusion of a dynamic aspect in the model to account for movement of students into and out of special education over time. Such an effort should incorporate new and improved data on actual practices and program effectiveness, related services, and expected future directions in special education.

Finally, similar cost estimation studies should be undertaken for both pre and postschool aged children. Using a resource-cost model approach, this effort will require separate analyses for these age groups of the types of handicapped children in these age groups and the expected incidence rates, their special education needs, types of programs and services required, the resources and prices for each program and service, program placement patterns, number of students per unit in the programs and services, and the organizational arrangements available for the delivery of special education services.

Special education is and will continue to be of significant interest to educational policy makers, planners, and administrators. As the magnitude of resources devoted to the education of handicapped children increases, so will the need and demand for improved information concerning the costs of such programs. By making explicit the programmatic aspects of special education and linking these with their associated costs, the resource-cost model approach can provide an important tool to assist decision making and planning for the provision of programs for the education of handicapped children.

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APPENDIX A

DATA FROM TWENTY-SIX STATES
IN SEPM SAMPLE

TABLE A-1

HANDICAPPING CATEGORIES REPORTED BY SAMPLE STATES *

STANDARD CATEGORIES	AK	AZ	AR	CA	DE	DC	FL	HI	ID	LA	ME	MA	MI
EMR	MR	EMH	EMR	EMR	EMH	MR	EMR	MILD MR	EMR	EMR	MEN MAT	NON CAT	EMI
TMR	MR	TMH	TMR	TMR	TMH	MR	TMR	MOD MR	TMR	TMR	MEN MAT	NON CAT	TMI
HEARING	HEARING	HH	HH	HEARING	DEAF HH	DEAF HH	DEAF HH	DEAF HH	DEAF HH	HI	AUDITION	NON CAT	HI
SPEECH	CD	SPEECH	SI	SPEECH APHASIC	SPEECH	SPEECH	SPEECH	SI	SPEECH	SI	S & L	NON CAT	S & L
VISION	VI	VH	VI	VISION	VI	BLIND VI	VISION	BLIND PS	VH	VI	VISION	NON CAT	VI
SED	ED	SEH	EH	ED HC	SEM AUTISTIC	ED	ED	SED	EH	BD	BH	NON CAT	EI
ORTHO	OH	PH	COHI	OH	OH	COHI	PH	OH/OHI	OH	OI	PHY MOB	NON CAT	POHI
OHI	HEALTH	HOME	COHI	-	OHI	HEALTH	HOSP/HB	OH/OHI	OHI	HOSP/HB OHI	-	NON CAT	HOSP/HB
SLD	LD	LD	SLD	ED HC	LD	LD NON CAT	SLD	SLD	SLD	LD ED HC	CER/PER	NON CAT	LD
MULTIPLE	-	MH	MULTI DB	MULTI DEV CTR	SEV MH DB C/R	-	PROFOUND	SEV MR PRO MR SEV MH	DB	DB MULTI S/P MR	MULTI	NON CAT	SMI MULTI

* SEE LIST OF ABREVIATIONS FOLLOWING THIS TABLE

TABLE A-1
(CONTINUED)

HANDICAPPING CATEGORIES REPORTED BY SAMPLE STATES *

STANDARD CATEGORIES	MN	MS	NB	NY	ND	OH	OK	OR	PA	SD	VT	WA	WV
EMR	EMR	EMR	EMH	EMR	EMH	EMR	EMH	MR	EMR	EMH	MR	MILD MR	MR
TMR	TMR	TMR	MR	TMR	TMH	TMR	TMR	MR	TMR	EMH	MR	MOD MR	MR
HEARING	HEARING	HI	ACOUSTIC	DEAF HH	DEAF HI	HEARING	DHH	DEAF HH	HI	DEAF	DEAF HH	HH	HI
SPEECH	SPEECH	L/S	SPEECH	SEV SI OTHER SI	S & L	SPEECH	SI	SI	S & L	SPEECH	SI	SPEECH	CD
VISION	VISION	VI	VH	BLIND PS	BLIND PS	VISUAL	BPS	VH	VI	VH	VI	BLIND PS	VI
SED	-	EH	ED	EH	ED	SBH	SED	SED	SED	ED	LD/BH	ED	BD
ORTHO	CRIPPLE	PH	OH	OH	OH	CRIPPLE	OH	OI	PH	PH	OH/HI	OI	OH
OHI	OHI	-	-	PH OTHER	OHI	-	OHI	OHI	-	OHI	OH/HI	NI	HEALTH
SLD	LD	SLD	LD	SLD	SLD	LBD	SLD	SLD	BI/LD	LD	LD/BH	SLD	SLD
MULTIPLE	-	DB S/P MR	-	-	MULTI	SEV MULT	MULTI	-	S/P	MULTI	MULTI	S/P MR MULTI	-

* SEE LIST OF ABREVIATIONS FOLLOWING THIS TABLE

Abbreviations for State Handicapping Categories in Table A-1

Abbreviation	Category Name
BD	Behavior Disorder
BH	Behavior Handicapped
BI	Brain Injured
BPS	Blind and Partially Sighted
B/VI	Blind/Visually Impaired
CD	Communication Disorder
Cer/Per	Cerebral/Perceptual
COHI	Crippled and Other Health Impaired
C/R	Complex and Rare
DB	Deaf/Blind
Dev Ctr	Development Center for Severely Handicapped
DHH	Deaf and Hard of Hearing
ED	Emotionally Disturbed
Ed Hc	Educationally Handicapped
EH	Emotionally Handicapped
EI	Emotionally Impaired
EMH	Educable Mentally Handicapped
EMI	Educable Mentally Impaired
EMR	Educable Mentally Retarded
H	Health
HH	Hard of Hearing
HI	Hearing Impaired
Home	Homebound
Hosp/Hb	Hospital/Homebound
LBD	Learning and Behavior Disability
LD	Learning Disability
L/S	Language and Speech
Men Mat	Mental Maturation
MH	Multi-handicapped
MR	Mentally Retarded
NI	Neurologically Impaired
Non Cat	Non Categorical
OHI	Other Health Impaired
OH	Orthopedically Handicapped
OI	Orthopedically Impaired
PH	Physically Handicapped
Phy Mob	Physical Mobility
POHI	Physical and Other Health Impaired
Pro MR	Profoundly Mentally Retarded
PS	Partially Sighted
SBH	Severe Behavior Handicap
SED	Severe Emotional Disturbance
SEH	Severely Emotionally Handicapped
SEM	Severely Emotionally Maladjusted
Sev MH	Severely Multi-handicapped
Sev MR	Severely Mentally Retarded

Abbreviation	Category Name
SI	Speech Impaired
S&L	Speech and Language
SLD	Specific Learning Disability
SMI	Severely Mentally Impaired
S/P	Severely or Profoundly Handicapped
S/P MR	Severely/Profoundly Mentally Retarded
TMH	Trainable Mentally Handicapped
TMI	Trainable Mentally Impaired
TMR	Trainable Mentally Retarded
VH	Visually Handicapped
VI	Visually Impaired

TABLE A-2

INCIDENCE RATES (%) REPORTED BY SAMPLE STATES

STANDARD CATEGORIES	AK	AZ	AR	CA	DE	DC	FL	HI	ID	LA	ME	MA	MI
EMR	1.64	1.50	2.60	2.00	1.90	1.90	1.75	1.50	1.70	2.82	3.18	-	1.25
TMR	0.36	0.45	0.40	0.30	0.45	0.20	0.40	0.30	0.40	0.688	0.70	-	0.39
HEARING	0.50	0.15	0.20	0.30	0.14	0.07	0.13	0.20	0.67	0.217	0.50	-	0.14
SPEECH	4.00	3.00	2.00	5.00	1.77	2.20	3.50	3.50	2.00	6.689	3.13	-	3.08
VISION	0.22	0.10	0.10	0.10	0.08	0.07	0.08	0.03	0.122	0.066	0.066	-	0.05
SED	2.00	1.00	0.20	1.20	2.27	0.43	1.00	0.127	0.35	0.573	3.52	-	0.63
ORTHO	1.00	0.10	0.11	0.40	0.25	0.20	0.20	0.04	0.27	0.063	0.54	-	0.21
OHI	0.50	0.15	0.19	-	0.14	0.40	0.20	0.06	0.06	0.252	-	-	0.04
SLD	8.00	4.00	2.00	2.84	4.30	4.00	2.00	2.00	3.39	2.78	2.66	-	0.93
MULTIPLE	-	0.10	0.112	0.21	0.33	-	0.20	0.267	0.014	0.328	0.70	-	0.23
TOTAL	18.22	10.55	7.912	12.35	11.63	8.47	9.46	8.274	8.976	14.476	14.996	11.09	6.95

NOTE: THE REPORTED INCIDENCE RATES WERE THOSE USED BY THE STATES FOR THE PURPOSE OF PLANNING WITH THE SEPM COMPUTER MODEL IN THE 1976-78 DATA GATHERING PERIOD. AS SUCH THEY DO NOT NECESSARILY REPRESENT OFFICIAL STATE ESTIMATES OR POLICY, BUT RATHER THE BEST ESTIMATES OF THE EXPECTED OCCURANCE OF HANDICAPPED STUDENTS AT THAT TIME.

TABLE A-2
(CONTINUED)

INCIDENCE RATES (%) REPORTED BY SAMPLE STATES

STANDARD CATEGORIES	MN	MS	NB	NY	ND	OH	OK	OR	PA	SD	VT	WA	WV
EMR	1.80	2.70	1.80	0.95	1.25	2.383	2.171	0.878	2.00	1.97	1.80	1.50	2.61
TMR	0.45	0.30	0.50	0.30	0.40	0.505	0.325	0.719	0.30	0.43	0.40	0.21	0.57
HEARING	0.40	0.40	0.10	0.15	0.55	0.111	0.18	0.325	0.60	0.20	0.575	0.15	0.30
SPEECH	2.80	3.50	2.90	2.21	3.00	4.478	3.245	2.768	3.50	3.00	3.50	4.50	3.84
VISION	0.09	0.08	0.07	0.07	0.10	0.047	0.06	0.118	0.10	0.10	0.05	0.038	0.14
SED	-	0.70	0.50	0.83	0.50	0.111	0.106	0.559	2.00	1.50	1.45	0.80	0.72
ORTHO	0.20	0.40	0.14	0.13	0.05	0.129	0.046	0.754	0.20	0.20	0.18	0.04	0.20
OHI	0.50	-	-	0.81	0.04	-	0.111	0.225	-	0.10	0.32	0.185	0.42
SLD	4.00	2.00	2.10	1.33	1.50	2.147	3.36	3.592	2.00	2.40	3.55	3.00	2.19
MULTIPLE	-	0.14	-	-	-	0.055	0.046	-	0.20	0.30	0.10	0.195	-
TOTAL	10.24	10.22	7.81	6.78	7.39	9.946	9.649	9.938	10.90	10.20	11.925	10.618	10.99

NOTE: THE REPORTED INCIDENCE RATES WERE THOSE USED BY THE STATES FOR THE PURPOSE OF PLANNING WITH THE SEPM COMPUTER MODEL IN THE 1976-78 DATA GATHERING PERIOD. AS SUCH THEY DO NOT NECESSARILY REPRESENT OFFICIAL STATE ESTIMATES OR POLICY, BUT RATHER THE BEST ESTIMATES OF THE EXPECTED OCCURANCE OF HANDICAPPED STUDENTS AT THAT TIME.

TABLE A-3

NUMBER OF HANDICAPPED STUDENTS SERVED BY ALL STATES IN 1976-77

Standard Categories	P.L. 94-142 Feb. Count	P.L. 89-313 Count	Total Served	Split/Combine Categories	Total Served	Allocation To* Multiple Cat.	Total Served
EMR	858,279	131,487	989,766	79%	781,915	(22,050)	759,865
TMR				21%	207,851	(5,861)	201,990
Hearing Impaired	42,567 23,735	27,522	70,089 23,735	(Hard of) (Hearing) (Deaf)	93,824	(2,646)	91,178
Speech Impaired	1,341,152	-	1,341,152	-	1,341,152	-	1,341,152
Visually Handicapped	31,323	9,925	41,248	-	41,248	(1,163)	40,085
SED	272,005	30,378	302,383	-	302,383	(8,527)	293,856
Orthopedic	82,582	8,425	91,007	-	91,007	(2,566)	88,441
Other Health Imp.	121,688	16,095	137,783	-	137,783	(3,885)	133,898
SLD	840,219	-	840,219	-	840,219	(23,694)	816,525
Multiple	-	-	-	-	-	70,392	70,392
Total	3,613,550	223,832	3,837,382	-	3,837,382	-	3,837,382

Source: Statistics reported by the Bureau of Education for the Handicapped, U.S.O.E. for the purpose of P.L. 94-142.

*2.82% deducted from each category except Speech and allocated to the Multiple category.

TABLE A-4

INSTRUCTIONAL PROGRAMS REPORTED BY SAMPLE STATES *

STANDARD PROGRAMS	AK	AZ	AR	CA	DE	DC	FL	HI	ID	LA	ME	MA	MI
IND SVC	-	-	AIDE	-	-	CONSULT	-	-	AIDE C/D	-	-	MOD REG	-
S & L	CON/IT	S & L	S & L	S & L	S & L	S & L	SUP INS	II	S & L	SPEECH	SPEECH	SPEECH	S & L
O D S	CON/IT	-	II	REM PE IND INS REG DAY	II	II	SUP INS PT/OT	II	RT	-	-	25% TIME	-
RES RM	RR	RR	RR	LDG	RR	-	RR	RS	RR	RI	RR	60% TIME	T/C
SP CLASS	SC	SC-MOD SC-SEV	SC	SC	SC REG DAY	SC VOC	SC	SC DC	SC	SC PUB DAY	SC REGION	SC	SC
O A D S	-	TUITION	PVT AG	PVT SCH	PVT DAY	PVT DAY	-	CONTRACT PVT SCH	CONTRACT	-	PVT DAY	PVT DAY	-
RESIDENT	CONTRACT OS	RESIDENT	PUB AG	-	RESIDENT PVT RES	STATE PVT RES	-	STATE OA	OA	PUB RES	PVT RES STATE	RESIDENT	-
HOSP/HBD	H & H	H & H	H & H	H & H	H & H	H & H	H & H	-	HOME	-	H & H	H & H	-

* SEE LIST OF ABBREVIATIONS FOLLOWING THIS TABLE

TABLE A-4
(CONTINUED)

INSTRUCTIONAL PROGRAMS REPORTED BY SAMPLE STATES *

STANDARD PROGRAMS	MS	NB	NY	ND	OH	OK	OR	PA	SD	VT	WA	WV
IND SVC	REGULAR	-	-	-	-	CONSULT	REG IND	-	MOD REG	REGULAR	PSYCHO	-
S & L	S & L	SPEECH	II	II	S & L	SPEECH	REG DIR	S & L	S & L	S & L	CDS	II
O D S	-	-	II	II	TUTOR	II	REG DIR	II	1-3 HRS	SP SVC CONSULT TUTOR	OTH SUP	II
RES RM	RR	RT	RR	RR	RR	RR	RR	RR	3-5 HRS	ERR AAL	RR	RR
SP CLASS	SC VOC	SC	SC	SC	SC	SC	SC PUB DAY	SC	SC	SC DO	SC	SC
O A D S	PVT DAY PUB DAY	-	-	-	SP DAY	-	PVT DAY	PVT SCH	OUT DIS	OA	CONTRACT	-
RESIDENT	SCH D/B	-	CONTRACT STATE ST SUP	STATE PVT RES	RESIDENT STATE	STATE SCH D/B	PVT RES PUB RES	STATE PVT SCH	-	PVT RES	OA	-
HOSP/HBD	-	-	HOME	H & H	HOME	H & H	H & H	-	OH	H & H	-	-

* SEE LIST OF ABREVIATIONS FOLLOWING THIS TABLE

Abbreviations for Instructional Programs

Abbreviation	Program Name
AAL	Accelerated Achievement Lab
Aide	Instructional Aide
CDS	Communication Disorder Specialist
C/D	Consultive/Diagnostic Service
Con/It	Consultant/Itinerant Program
Consult	Consultive Services
Contract	State Contract
DC	District Center
DO	Diversified Occupations Program
ERR	Elementary Resource Room
H&H	Hospital and Homebound
II	Itinerant Instruction
Ind Ins	Individual Instruction
IS	Itinerant Services
LDG	Learning Disability Group
Mod Reg	Regular Program with Modifications
OA	Other Agency Programs or Services
OH	Other Health Service
OS	Out-of-State Program
Oth Sup	Other Supportive Services
Out Dis	Out-of-District Program
Psycho	Psychological Services
PT/OT	Physical Therapy/Occupational Therapy
Pub Ag	Public Agency
Pub Day	Public Day School Program
Pub Res	Public Residential School
Pvt Ag	Private Agency Program
Pvt Day	Private Day School
Pvt Res	Private Residential School
Pvt Sch	Private School
Reg Day	Regular Day Class
Reg Dir	Regular Class with Direct Instruction
Reg Ind	Regular Class with Indirect Services
Region	Regional Public Day School
Rem PE	Remedial Physical Education
Resident	Residential School
RI	Resource/Itinerant Teacher
RR	Resource Room
RS	Resource Services
RT	Resource Teacher
SCH D/B	State Schools for Deaf or Blind
S & L	Speech and Language
Sp Day	Special Day School
SC	Special Class (Full, Part, Integrated, Moderate, or Severe)

Abbreviation	Program Name
Sp Svc	Special Services
State	State Operated School or Institution
St Sup	State Supported School or Program
Sup Ins	Supplemental Instruction
T/C	Teacher/Consultant
Tuition	Tuition/Contract
Voc	Vocational Program

TABLE A-5

RESOURCES, QUANTITIES, PRICES FOR INSTRUCTIONAL PROGRAMS REPORTED BY SAMPLE STATES

Program	Resource	n	Range of Values	Averages		Most Likely Value	Alternative Values	
				n	All States Reporting		Low	High
Indirect Services	Teacher	5	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Benefits	na	na	na	na	1,642	796	2,778
	Materials	5	$ 200-400	$305	$ 305	305	200	400
	Travel	4	350-1,000	837	670	837	670	1,000
	Maint. & Op.	2	500-678	589	236	0	0	236
	Total					$ 15,412	$ 13,031	$ 18,304
Speech & Language	Teacher	15	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Benefits	na	na	na	na	1,642	796	2,778
	Materials	13	$ 50-2,000	$582	$ 505	582	300	1,000
	Travel	11	105-2,000	855	627	855	627	1,000
	Maint. & Op.	5	300-1,443	784	261	0	0	261
	Total					$ 15,707	$ 13,088	$ 18,929
Other Direct Services	Teacher	14	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Benefits	na	na	na	na	1,642	796	2,778
	Materials	13	$ 200-2,000	$606	$ 563	606	300	1,000
	Travel	12	105-2,500	913	782	913	782	1,000
	Maint. & Op.	4	300-1,000	630	180	0	0	180
	Total					$ 15,789	$ 13,243	$ 18,848

TABLE A-5

RESOURCES, QUANTITIES, PRICES FOR INSTRUCTIONAL PROGRAMS REPORTED BY SAMPLE STATES (continued)

Program	Resource	n	Range of Values	Averages		Most Likely Value	Alternative Values	
				n	All States Reporting		Low	High
Resource Room	Teacher	14	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Aide							
	(quantity)	5	.25-1.0/ unit	.85/ unit	.30/unit	.30/unit	0	1.0/unit
	(price)		na	na	na	5,556	3,662	8,081
	cost					1,667	0	8,081
	Benefits	na	na	na	na	1,858	796	4,394
	Materials	14	$ 200-1,400	$ 617	$ 617	617	400	1,000
	Maint. & Op.	6	500-2,710	1,437	616	616	0	1,437
	Total					$ 17,386	$ 12,561	$ 28,802
Special Class	Teacher	14	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Aide							
	(quantity)	9	.25-1.0/ unit	.69/ unit	.44/unit	.44/unit	.25/unit	1.0/unit
	(price)		na	na	na	5,556	3,662	8,081
	cost					2,445	915	8,081
	Benefits	na	na	na	na	1,959	860	4,394
	Materials	13	$ 200-1,400	$ 721	$ 669	721	500	1,000
	Maint. & Op.	6	500-3,380	1,760	754	754	0	1,760
	Total					$ 18,507	$ 13,640	$ 29,125
Other Agency Day Schools	Cost/ Student	16	$1,144-7,000	$3,687	$3,687	$ 3,687	$ 2,500	$ 5,000
Residential Schools	Cost/ Student	13	$5,100-20,000	$10,390	$10,390	$ 10,390	$ 8,000	$ 14,000
Hospital & Homebound	Teacher	8	na	na	na	$ 12,628	$ 11,365	$ 13,890
	Benefits	na	na	na	na	1,642	796	2,778
	Materials	6	$ 200-656	$ 378	$ 284	378	284	500
	Travel	6	125-2,000	704	528	704	528	1,000
	Total					$ 15,352	$ 12,973	$ 18,168

TABLE A-6

SPECIFIC RELATED SERVICES DATA REPORTED BY SAMPLE STATES

Specific Related Services	Category	State	Cost	No/Unit	Cost/Student	Begin %	Exp. %
Vocational Services	EMR	AK	$ 200/student	1	$ 200	2	42
		AZ	$ 350/student	1	$ 350	5	20
		ND	$12,000/unit	20	$ 600	10	30
		PA	$13,000/unit	26	$ 500	12.5	15
		Avg.			$ 412	7	27
Special Transportation	TMR	AZ	$ 500/student	1	$ 500	10	25
		CA	$ 734/student	1	$ 734	90	90
		ND	$ 2,000/student	1	$2,000	85	95
		OK	$ 450/student	1	$ 450	20	40
		PA	--	1	--	10	10
		VT	$ 200/student	1	$ 200	64	69
		Avg.			$ 777	46	55
Special Transportation	Hearing	CA	$ 734/student	1	$ 734	90	90
		ND	$ 1,000/student	1	$1,000	20	40
		OK	$ 450/student	1	$ 450	0	5
		VT	$ 200/student	1	$ 200	13	13
		Avg.			$ 596	31	37
Special Transportation	Vision	CA	$ 734/student	1	$ 734	90	90
		ND	$ 1,000/student	1	$1,000	10	20
		OK	$ 450/student	1	$ 450	13	80
		VT	$ 100/student	1	$ 100	6	6
		Avg.			$ 571	30	49
Psychological Services	SED	AK	$27,000/unit	50	$ 540	1.5	100
		AZ	$ 200/student	1	$ 200	25	50
		ND	$ 720/student	1	$ 720	10	20
		PA	$ 40/student	1	$ 40	13.5	50
		Avg.			$ 375	12.5	55
Physical Therapy	Ortho	AK	$ 833/student	1	$ 833	1	100
		AZ	$ 350/student	1	$ 350	10	40
		ND	$14,500/unit	15	$ 967	4	18
		OK	$ 50/student	1	$ 50	6	20
		PA	$ 158/student	1	$ 158	53	56
		Avg.			$ 472	15	34

TABLE A-6

SPECIFIC RELATED SERVICES DATA REPORTED BY SAMPLE STATES
(continued)

Specific Related Services	Category	State	Cost	No/Unit	Cost/Student	Begin %	Exp. %
Occupational Therapy	Ortho	AK	$ 833/student	1	$ 833	1	100
		AZ	$ 350/student	1	$ 350	5	30
		ND	$13,500/unit	15	$ 900	2	9
		OK	$ 50/student	1	$ 50	6	20
		PA	$ 113/student	1	$ 113	3	6
		Avg.			$ 449	3	16
Special Transportation	Ortho	AK	$ 1,828/student	1	$1,828	20	100
		AZ	$ 500/student	1	$ 500	40	80
		CA	$ 734/student	1	$ 734	90	90
		ND	$ 1,000/student	1	$1,000	4	10
		OK	$ 450/student	1	$ 450	6	92
		VT	$ 100/student	1	$ 100	9	9
		Avg.			$ 769	28	64
Special Transportation	Multiple	AZ	$ 500/student	1	$ 500	20	80
		CA	$ 734/student	1	$ 734	90	90
		OK	$ 450/student	1	$ 450	6	80
		VT	$ 400/student	1	$ 400	79	89
		Avg.			$ 521	49	85

TABLE A-7

NONSPECIFIC RELATED SERVICES DATA REPORTED BY SAMPLE STATES

Service	State	Resource/Price Specification	Calculated Common Basis	Begin Level (50%)	Expect Level 100%
Student Assessment	AR	$686,300	$ 25/student		
	CA	$ 86/student	$ 86/student		
	HI	$208/student	$208/student		
	MA	$230/student	$230/student		
	MS	$ 35/student	$ 35/student		
	OK	$ 60/student	$ 60/student		
	VT	$ 1/all stud.	$ 8/student		
	Avg.		$ 93/student	1,918,500 student	4,705,000 student
LEA Administration	AZ	$33,000/adm.	1,012 st/adm.		
	AR	$17,000/adm.	371 st/adm.		
	CA	$ 200/student	--		
	ID	$16,419/adm.	419 st/adm.		
	ND	$28,000/adm.	351 st/adm.		
	OK	$25,000/adm.	1,500 st/adm.		
	VT	$16,500/adm.	304 st/adm.		
	Avg.	$22,650/adm.	660/st/adm.	2,900 adm. (1,918,500 student)	7,100 adm. (4,705,000 student)
Inservice Training	AZ	$ 80/tch.	$ 80/tch.		
	AR	$605,000	$ 584/tch.		
	ND	$ 50,000	$ 113/tch.		
	OK	$691,540	$ 340/tch.		
	VT	$172,000	$ 389/tch.		
	Avg.		$ 303/tch.	89,500 tch.	216,000 tch.

APPENDIX B

LOW AND HIGH ALTERNATIVE PROJECTIONS

LOW ALTERNATIVE PROJECTIONS

Report A-1

SCHOOL AGE NUMBER OF STUDENTS -- BY CLASSIFICATION AND YEAR

CLASSIFICATION CATEGORIES		YEAR				
		76-77	77-78	78-79	79-80	80-81
EMR	NUMBER OF STUDENTS SERVED	759865	742457	715132	679878	638678
EMR	PERCENT OF STUDENTS SERVED	111	109	107	104	100
EMR	NUMBER OF STUDENTS UNSERVED	-72266	-64159	-49006	-27428	0
TMR	NUMBER OF STUDENTS SERVED	201990	193587	178972	158931	134215
TMR	PERCENT OF STUDENTS SERVED	140	136	128	116	100
TMR	NUMBER OF STUDENTS UNSERVED	-57495	-51046	-38989	-21822	0
HEARING	NUMBER OF STUDENTS SERVED	91178	90781	90793	91342	92562
HEARING	PERCENT OF STUDENTS SERVED	91	92	94	97	100
HEARING	NUMBER OF STUDENTS UNSERVED	8474	7523	5747	3216	0
SPEECH	NUMBER OF STUDENTS SERVED	1341152	1327842	1313507	1300487	1291239
SPEECH	PERCENT OF STUDENTS SERVED	96	97	98	99	100
SPEECH	NUMBER OF STUDENTS UNSERVED	48993	43498	33225	18596	0
VISION	NUMBER OF STUDENTS SERVED	40085	38537	35871	32234	27769
VISION	PERCENT OF STUDENTS SERVED	134	131	124	114	100
VISION	NUMBER OF STUDENTS UNSERVED	-10189	-9046	-6909	-3867	0
SED	NUMBER OF STUDENTS SERVED	293856	296282	303539	315779	333223
SED	PERCENT OF STUDENTS SERVED	82	84	87	93	100
SED	NUMBER OF STUDENTS UNSERVED	64891	57612	44005	24630	0
ORTHO	NUMBER OF STUDENTS SERVED	88441	86876	84593	81792	78678
ORTHO	PERCENT OF STUDENTS SERVED	104	104	103	102	100
ORTHO	NUMBER OF STUDENTS UNSERVED	-3737	-3318	-2534	-1418	0
OHI	NUMBER OF STUDENTS SERVED	133898	133133	132797	133087	134215
OHI	PERCENT OF STUDENTS SERVED	93	93	95	97	100
OHI	NUMBER OF STUDENTS UNSERVED	10597	9408	7186	4022	0
SLD	NUMBER OF STUDENTS SERVED	816525	810948	807136	806343	809917
SLD	PERCENT OF STUDENTS SERVED	94	94	96	97	100
SLD	NUMBER OF STUDENTS UNSERVED	55430	49212	37589	21039	0
MULTIPLE	NUMBER OF STUDENTS SERVED	70392	69869	69457	69268	69421
MULTIPLE	PERCENT OF STUDENTS SERVED	94	95	96	98	100
MULTIPLE	NUMBER OF STUDENTS UNSERVED	4347	3859	2948	1650	0
TOTAL	NUMBER OF STUDENTS SERVED	3837382	3790312	3731797	3669141	3609917
TOTAL	PERCENT OF STUDENTS SERVED	99	99	99	99	100
TOTAL	NUMBER OF STUDENTS UNSERVED	49287	43781	33496	18849	0

LOW ALTERNATIVE PROJECTIONS

Table A-2

SCHOOL AGE — NUMBER OF STUDENTS -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	142072	150707	168653	195331	230178
SPEECH & LANGUAGE INSTR	1468391	1471746	1490549	1525417	1576909
OTHER DIRECT SERVICES	176498	185118	203764	232710	272596
RESOURCE ROOM	918830	941125	992566	1072883	1182226
SPECIAL CLASS	1241579	1185863	1087519	950479	777962
OTHER AGENCY DAY SCHOOL	21714	20001	16856	12415	6803
RESIDENTIAL SCHOOL	126692	118833	104760	85393	61715
HOSPITAL & HOMEBOUND	31588	30946	29965	28708	27236
TOTAL	4127364	4104339	4094632	4103336	4135625

LOW ALTERNATIVE PROJECTIONS

Report B-1

SCHOOL AGE NUMBER OF INSTRUCTIONAL PERSONNEL -- BY CLASSIFICATION AND YEAR

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
CERTIFIED	37702	36533	34602	32059	29068
NON-CERTIFIED	6783	6401	5730	4827	3757
TMR					
CERTIFIED	13276	12848	12108	11062	9688
NON-CERTIFIED	3193	3070	2858	2563	2194
HEARING					
CERTIFIED	4688	4649	4610	4579	4562
NON-CERTIFIED	727	699	649	577	482
SPEECH					
CERTIFIED	17999	17695	17254	16711	16103
NON-CERTIFIED	464	426	356	255	124
VISION					
CERTIFIED	1688	1618	1497	1332	1134
NON-CERTIFIED	235	219	192	156	115
SED					
CERTIFIED	17930	17778	17603	17357	16971
NON-CERTIFIED	3662	3550	3348	3031	2563
ORTHO					
CERTIFIED	4842	4738	4577	4370	4132
NON-CERTIFIED	585	559	513	452	378
OHI					
CERTIFIED	8204	8089	7932	7744	7536
NON-CERTIFIED	1456	1398	1295	1149	958
SLD					
CERTIFIED	31712	31421	31127	30877	30718
NON-CERTIFIED	3279	3134	2874	2505	2024
MULTIPLE					
CERTIFIED	5219	5226	5286	5407	5600
NON-CERTIFIED	1243	1237	1235	1240	1253
TOTAL					
CERTIFIED	143260	140595	136596	131498	125512
NON-CERTIFIED	21627	20693	19050	16755	13848

LOW ALTERNATIVE PROJECTIONS

Report B-2

SCHOOL AGE NUMBER OF INSTRUCTIONAL PERSONNEL -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES					
CERTIFIED	1127	1197	1340	1556	1839
NON-CERTIFIED	0	0	0	0	0
SPEECH & LANGUAGE INSTR					
CERTIFIED	17709	17752	17982	18407	19032
NON-CERTIFIED	0	0	0	0	0
OTHER DIRECT SERVICES					
CERTIFIED	5380	5632	6180	7035	8216
NON-CERTIFIED	0	0	0	0	0
RESOURCE ROOM					
CERTIFIED	29893	30657	32407	35126	38820
NON-CERTIFIED	0	0	0	0	0
SPECIAL CLASS					
CERTIFIED	86519	82787	76214	67029	55406
NON-CERTIFIED	21631	20698	19054	16757	13852
OTHER AGENCY DAY SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
RESIDENTIAL SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
HOSPITAL & HOMEBOUND					
CERTIFIED	2632	2570	2473	2345	2199
NON-CERTIFIED	0	0	0	0	0
TOTAL					
CERTIFIED	143260	140595	136596	131498	125512
NON-CERTIFIED	21631	20698	19054	16757	13852

LOW ALTERNATIVE PROJECTIONS

Report C-1

SCHOOL AGE

COSTS -- BY CLASSIFICATION AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

CLASSIFICATION		YEAR				
		76-77	77-78	78-79	79-80	80-81
	EMR	592320	565321	518665	456224	382398
	TMR	429025	401118	352234	288075	215398
	HEARING	225982	215699	197098	170180	134496
	SPEECH	236407	232352	226438	219128	210908
	VISION	68876	64758	57558	48045	37184
	SED	420646	414318	404429	389435	366906
	ORTHO	105860	101809	94892	85553	74347
	OHI	208968	202222	190629	174385	153503
	SLD	447686	439997	428740	414551	397917
	MULTIPLE	239479	233200	222863	208841	191387
TOTAL	(CONSTANT $)	2975249	2870794	2693546	2454417	2164444
TOTAL	(INFLATED $)	2975249	3028973	2998548	2882891	2682374

LOW ALTERNATIVE PROJECTIONS

Report C-2

SCHOOL AGE COSTS -- BY INSTRUCTIONAL PROGRAM AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

TYPE OF PROGRAM	PRICE PER UNIT	YEAR 76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	13031	14685	15598	17461	20276	23964
SPEECH & LANGUAGE INSTR	13088	231775	232338	235348	240910	249090
OTHER DIRECT SERVICES	13243	71247	74584	81841	93164	108804
RESOURCE ROOM	12561	375485	385082	407064	441217	487617
SPECIAL CLASS	13640	1180119	1129214	1039558	914275	755737
OTHER AGENCY DAY SCHOOL	2500	54284	50002	42140	31037	17007
RESIDENTIAL SCHOOL	8000	1013536	950663	838080	683143	493719
HOSPITAL & HOMEBOUND	12973	34144	33340	32082	30421	28527
TOTAL (CONSTANT $)		2975275	2870821	2693574	2454443	2164465
TOTAL (INFLATED $)		2975275	3029001	2998579	2882922	2682400

LOW ALTERNATIVE PROJECTIONS

Report RS

SCHOOL AGE

SUMMARY: STUDENTS, PERSONNEL, COSTS FOR RELATED SERVICES
(COSTS IN THOUSANDS OF DOLLARS)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
VOC SERV					
STUDENTS	53190	66821	92967	129176	172443
PERSONNEL	0	0	0	0	0
COSTS	21914	27530	38302	53220	71046
TMR					
SP TRANS					
STUDENTS	92915	90792	87159	81690	73818
PERSONNEL	0	0	0	0	0
COSTS	72194	70545	67722	63473	57356
HEARING					
SP TRANS					
STUDENTS	28265	28686	29780	31604	34247
PERSONNEL	0	0	0	0	0
COSTS	16845	17096	17748	18835	20411
VISION					
SP TRANS					
STUDENTS	12025	12293	12805	13344	13606
PERSONNEL	0	0	0	0	0
COSTS	6866	7019	7311	7619	7769
SED					
PSY SERV					
STUDENTS	35262	48293	75581	119364	183272
PERSONNEL	0	0	0	0	0
COSTS	13223	18109	28342	44761	68726
ORTHO					
P T					
STUDENTS	13266	14682	17510	21593	26750
PERSONNEL	0	0	0	0	0
COSTS	6261	6929	8264	10191	12626
O T					
STUDENTS	2653	3735	5836	8833	12588
PERSONNEL	0	0	0	0	0
COSTS	1191	1677	2620	3966	5652

LOW ALTERNATIVE PROJECTIONS

Report RS
(continued)

SP TRANS					
STUDENTS	24763	27452	32822	40568	50353
PERSONNEL	0	0	0	0	0
COSTS	19042	21110	25240	31196	38721
MULTIPLE					
SP TRANS					
STUDENTS	34492	36751	41535	48903	59007
PERSONNEL	0	0	0	0	0
COSTS	17970	19147	21639	25478	30742
ASSESS					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	178420	204334	256163	333906	437564
LEA ADMN					
STUDENTS	0	0	0	0	0
PERSONNEL	2900	3320	4160	5420	7100
COSTS	65684	75197	94223	122762	160814
INSERV					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	27118	30951	38617	50116	65448
TOTAL COST					
CONSTANT $	446728	499644	606191	765523	976975
INFLATED $	446728	527174	674832	899162	1210631

HIGH ALTERNATIVE PROJECTIONS

Report A-1

SCHOOL AGE — NUMBER OF STUDENTS -- BY CLASSIFICATION AND YEAR

CLASSIFICATION CATEGORIES		YEAR				
		76-77	77-78	78-79	79-80	80-81
EMR	NUMBER OF STUDENTS SERVED	759865	787266	847612	941613	1073345
EMR	PERCENT OF STUDENTS SERVED	67	70	77	87	100
EMR	NUMBER OF STUDENTS UNSERVED	381150	338429	258687	145221	0
TMR	NUMBER OF STUDENTS SERVED	201990	203437	208107	216492	229668
TMR	PERCENT OF STUDENTS SERVED	83	84	88	93	100
TMR	NUMBER OF STUDENTS UNSERVED	42157	37432	28612	16062	0
HEARING	NUMBER OF STUDENTS SERVED	91178	97672	111159	131558	159361
HEARING	PERCENT OF STUDENTS SERVED	54	58	68	82	100
HEARING	NUMBER OF STUDENTS UNSERVED	78230	69462	53095	29806	0
SPEECH	NUMBER OF STUDENTS SERVED	1341152	1418918	1582716	1832272	2174814
SPEECH	PERCENT OF STUDENTS SERVED	58	62	71	83	100
SPEECH	NUMBER OF STUDENTS UNSERVED	970774	861966	658867	369871	0
VISION	NUMBER OF STUDENTS SERVED	40085	40508	41699	43749	46871
VISION	PERCENT OF STUDENTS SERVED	80	82	86	92	100
VISION	NUMBER OF STUDENTS UNSERVED	9741	8649	6611	3711	0
SED	NUMBER OF STUDENTS SERVED	293856	319416	371907	450825	557765
SED	PERCENT OF STUDENTS SERVED	50	55	65	80	100
SED	NUMBER OF STUDENTS UNSERVED	299073	265552	202982	113949	0
ORTHO	NUMBER OF STUDENTS SERVED	88441	92292	100605	113429	131239
ORTHO	PERCENT OF STUDENTS SERVED	63	67	74	85	100
ORTHO	NUMBER OF STUDENTS UNSERVED	51072	45348	34663	19459	0
OHI	NUMBER OF STUDENTS SERVED	133898	142486	160443	187701	224981
OHI	PERCENT OF STUDENTS SERVED	56	60	69	82	100
OHI	NUMBER OF STUDENTS UNSERVED	105267	93468	71445	40107	0
SLD	NUMBER OF STUDENTS SERVED	816525	868544	977372	1142599	1368632
SLD	PERCENT OF STUDENTS SERVED	56	61	69	82	100
SLD	NUMBER OF STUDENTS UNSERVED	638394	566840	433279	243232	0
MULTIPLE	NUMBER OF STUDENTS SERVED	70392	74300	82559	95162	112490
MULTIPLE	PERCENT OF STUDENTS SERVED	59	63	71	84	100
MULTIPLE	NUMBER OF STUDENTS UNSERVED	49190	43677	33385	18742	0
TOTAL	NUMBER OF STUDENTS SERVED	3837382	4044839	4484179	5155400	6079166
TOTAL	PERCENT OF STUDENTS SERVED	59	63	72	84	100
TOTAL	NUMBER OF STUDENTS UNSERVED	2625285	2331054	1781855	1000385	0

HIGH ALTERNATIVE PROJECTIONS

Report A-2

SCHOOL AGE NUMBER OF STUDENTS -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	142072	150155	167207	193204	228912
SPEECH & LANGUAGE INSTR	1468391	1552752	1730569	2001580	2373696
OTHER DIRECT SERVICES	176498	186312	207049	238692	282195
RESOURCE ROOM	918830	970510	1079611	1246033	1474725
SPECIAL CLASS	1241579	1301545	1429755	1626574	1898682
OTHER AGENCY DAY SCHOOL	21714	22862	25296	29024	34155
RESIDENTIAL SCHOOL	126692	132871	146065	166314	194300
HOSPITAL & HOMEBOUND	31588	33523	37581	43751	52205
TOTAL	4127364	4350530	4823133	5545172	6538870

HIGH ALTERNATIVE PROJECTIONS

Report B-1

SCHOOL AGE NUMBER OF INSTRUCTIONAL PERSONNEL -- BY CLASSIFICATION AND YEAR

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
CERTIFIED	62680	64941	69919	77673	88539
NON-CERTIFIED	60370	62547	67342	74810	85276
TMR					
CERTIFIED	19446	19585	20035	20842	22109
NON-CERTIFIED	18479	18612	19039	19806	21011
HEARING					
CERTIFIED	10588	11342	12909	15277	18506
NON-CERTIFIED	8134	8713	9917	11736	14217
SPEECH					
CERTIFIED	30290	32045	35745	41381	49115
NON-CERTIFIED	4641	4910	5477	6341	7525
VISION					
CERTIFIED	4126	4170	4292	4503	4823
NON-CERTIFIED	2784	2813	2896	3038	3255
SED					
CERTIFIED	34662	37677	43868	53178	65792
NON-CERTIFIED	32289	35097	40865	49537	61287
ORTHO					
CERTIFIED	9135	9532	10391	11715	13554
NON-CERTIFIED	6159	6427	7006	7899	9139
OHI					
CERTIFIED	16030	17059	19208	22473	26935
NON-CERTIFIED	11501	12239	13781	16123	19325
SLD					
CERTIFIED	58388	62108	69889	81705	97868
NON-CERTIFIED	51356	54628	61472	71864	86081
MULTIPLE					
CERTIFIED	9478	10004	11117	12814	15147
NON-CERTIFIED	9090	9594	10661	12289	14526
TOTAL					
CERTIFIED	254823	268463	297373	341561	402388
NON-CERTIFIED	204803	215580	238456	273443	321642

HIGH ALTERNATIVE PROJECTIONS

Report B-2

SCHOOL AGE NUMBER OF INSTRUCTIONAL PERSONNEL -- BY INSTRUCTIONAL PROGRAM AND YEAR

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES					
CERTIFIED	4233	4479	5001	5793	6881
NON-CERTIFIED	0	0	0	0	0
SPEECH & LANGUAGE INSTR					
CERTIFIED	28937	30595	34086	39410	46719
NON-CERTIFIED	0	0	0	0	0
OTHER DIRECT SERVICES					
CERTIFIED	10540	11112	12322	14173	16717
NON-CERTIFIED	0	0	0	0	0
RESOURCE ROOM					
CERTIFIED	60710	64108	71290	82246	97302
NON-CERTIFIED	60710	64108	71290	82246	97302
SPECIAL CLASS					
CERTIFIED	144093	151472	167166	191197	224340
NON-CERTIFIED	144093	151472	167166	191197	224340
OTHER AGENCY DAY SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
RESIDENTIAL SCHOOL					
CERTIFIED	0	0	0	0	0
NON-CERTIFIED	0	0	0	0	0
HOSPITAL & HOMEBOUND					
CERTIFIED	6310	6697	7508	8742	10429
NON-CERTIFIED	0	0	0	0	0
TOTAL					
CERTIFIED	254823	268463	297373	341561	402388
NON-CERTIFIED	204803	215580	238456	273443	321642

HIGH ALTERNATIVE PROJECTIONS

Report C-1

SCHOOL AGE

COSTS -- BY CLASSIFICATION AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR	1951976	2022386	2177413	2418885	2757278
TMR	992842	999954	1022911	1064119	1128850
HEARING	568461	608939	693036	820198	993563
SPEECH	620266	656206	731974	847389	1005755
VISION	187266	189250	194811	204380	218939
SED	1297253	1410095	1641807	1990229	2462323
ORTHO	306991	320347	349200	393705	455525
OHI	590193	628063	707193	827372	991674
SLD	1682167	1789340	2013505	2353925	2819587
MULTIPLE	568615	600181	666913	768723	908692
TOTAL (CONSTANT $)	8766030	9224761	10198763	11688925	13742186
TOTAL (INFLATED $)	8766030	9983951	11946539	14818910	18855792

HIGH ALTERNATIVE PROJECTIONS

Report C-2

SCHOOL AGE — COSTS -- BY INSTRUCTIONAL PROGRAM AND YEAR
(COSTS IN THOUSANDS OF DOLLARS)

TYPE OF PROGRAM	PRICE PER UNIT	YEAR 76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES	18304	77480	81983	91538	106035	125949
SPEECH & LANGUAGE INSTR	18929	547748	579132	645213	745991	884343
OTHER DIRECT SERVICES	18848	198657	209438	232245	267132	315081
RESOURCE ROOM	28802	1748569	1846438	2053294	2368849	2802492
SPECIAL CLASS	29125	4196708	4411621	4868706	5568610	6533902
OTHER AGENCY DAY SCHOOL	5000	108570	114310	126480	145120	170774
RESIDENTIAL SCHOOL	14000	1773687	1860193	2044909	2328395	2720199
HOSPITAL & HOMEBOUND	18168	114640	121671	136405	158824	189474
TOTAL (CONSTANT $)		8766059	9224786	10198790	11688956	13742214
TOTAL (INFLATED $)		8766059	9983978	11946571	14818950	18855824

HIGH ALTERNATIVE PROJECTIONS

Report RS

SCHOOL AGE

SUMMARY: STUDENTS, PERSONNEL, COSTS FOR RELATED SERVICES
(COSTS IN THOUSANDS OF DOLLARS)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
VOC SERV					
STUDENTS	53190	70853	110189	178906	289803
PERSONNEL	0	0	0	0	0
COSTS	21914	29191	45397	73709	119398
TMR					
SP TRANS					
STUDENTS	92915	95411	101348	111276	126317
PERSONNEL	0	0	0	0	0
COSTS	72194	74134	78747	86461	98148
HEARING					
SP TRANS					
STUDENTS	28265	30864	36460	45519	58963
PERSONNEL	0	0	0	0	0
COSTS	16845	18394	21730	27129	35141
VISION					
SP TRANS					
STUDENTS	12025	12922	14886	18112	22966
PERSONNEL	0	0	0	0	0
COSTS	6866	7378	8499	10341	13113
SED					
PSY SERV					
STUDENTS	35262	52064	92604	170411	306770
PERSONNEL	0	0	0	0	0
COSTS	13223	19524	34726	63904	115038
ORTHO					
P T					
STUDENTS	13266	15597	20825	29945	44621
PERSONNEL	0	0	0	0	0
COSTS	6261	7361	9829	14134	21061
O T					
STUDENTS	2653	3968	6941	12250	20998
PERSONNEL	0	0	0	0	0
COSTS	1191	1781	3116	5500	9428

HIGH ALTERNATIVE PROJECTIONS

Report RS
(continued)

SP TRANS					
STUDENTS	24763	29164	39034	56260	83992
PERSONNEL	0	0	0	0	0
COSTS	19042	22427	30017	43263	64589
MULTIPLE					
SP TRANS					
STUDENTS	34492	39081	49370	67184	95616
PERSONNEL	0	0	0	0	0
COSTS	17970	20361	25721	35002	49815
ASSESS					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	178420	204334	256163	333906	437564
LEA ADMN					
STUDENTS	0	0	0	0	0
PERSONNEL	2900	3320	4160	5420	7100
COSTS	65684	75197	94223	122762	160814
INSERV					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	27118	30951	38617	50116	65448
TOTAL COST					
CONSTANT $	446728	511033	646785	866227	1189557
INFLATED $	446728	553090	757625	1098179	1632203